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Data-Driven Decision Making: Teachers' Use of Data in the Classroom

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DATA-DRIVEN DECISION MAKING: TEACHERS' USE OF DATA IN THE CLASSROOM

by

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ABSTRACT

Data-driven decision making has become an important educational issue in the United States, primarily because of federal and state emphasis on school accountability and achievement. Data use has been highlighted as a key factor in monitoring student progress and informing decision making at various levels of the education system. Federal and state policies require educators to use data to inform decision making and the assumption is that educators already know how to analyze, interpret, and use data to make informed decisions. The purpose of this study was to gain a better understanding of classroom teachers' engagement in data-driven decision making practices at the micro level.

Four research questions guided this investigation: (a) Why and how do select classroom elementary teachers choose specific data to inform their practice?; (b) How are data being used by these teachers to make instructional decisions?; (c) In relation to data use, what practices support instruction? What areas do these teachers seem to struggle with?; (d) What accounts for the variations in this select group of elementary teachers' ability to use and make decisions around data within and across schools?

A qualitative case study/cross case analysis design was employed to study classroom teachers at two elementary schools in San Diego County. Interviews, classroom observations, and documents were used to compare and contrast findings within and across cases. The findings suggest that: (a) Teachers used a variety of data in different ways and for different purposes; (b) There were variations in teachers' capacities to engage in data-driven practices; (c) Contextual and cultural differences as well as differences in teachers' perspectives concerning autonomy and ownership of their

work may have accounted for differences in teachers' capacities to use data.

The findings from this research study have implications for district and school leaders who are intent on improving data use and promoting a culture of continuous learning.

DEDICATION

To David- my husband and best friend- thank you for your love, support, and encouragement throughout this entire process.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Since the passage of the No Child Left Behind (NCLB) legislation in 2001, much attention has been called to the failure of public schools to provide an adequate education for all students. The legislation calls for increased accountability by requiring states to develop yearly assessments that determine whether students are meeting academic standards set forth by each state. In addition to state assessments, many school districts are developing their own forms of assessments, such as benchmark assessments, that are given to students periodically throughout the school year. These types of assessments provide information about student academic progress towards specific grade level standards. The emphasis on testing, both state and district-created, has placed an enormous amount of pressure on school leaders to ensure that all students are meeting performance standards, especially since results from state assessments are made public each year. Failure for individual schools to meet yearly assessment goals may lead to sanctions from the state, consequences from school districts, and negative public stigma.

In this era of accountability, school leaders are being asked to collect and analyze data to make informed decisions about teaching and learning. Many states and districts are enacting policies and providing incentives for schools to incorporate "data-driven decision making" in their practices (LaPointe, Brett, Kagle, Midouhas, & Sanchez, 2009; Reichardt, 2000). Data-driven decision making can be defined as teachers, principals, and administrators systematically collecting and analyzing data to inform a range of decisions aimed to improve performance of students and schools (Ikemoto & Marsh,

2007). Data may be used to track progress, identify strengths and problem areas, and match solutions to identified problem areas (Reichardt, 2000). Data may include but not be limited to test results from state assessments, district-created benchmarks, and other types of classroom data collected by individual teachers. The emphasis on data-driven decision making is evident not only from the No Child Left Behind legislation, but also from federal grant competitions such as the federal Race to the Top grant. The Race to the Top grant encourages states to design comprehensive educational reform plans that meet the educational requirements and priorities set forth by the federal government. These requirements include preparing students for college and the workplace, improving the lowest achieving schools, recruiting and retaining effective teachers and principals, and building data systems that monitor student growth (U.S. Department of Education, 2011). States that design comprehensive school reform plans that address these four specific areas are eligible to receive a portion of four billion dollars set aside by the federal government (U.S. Department of Education, 2011). According to Race to the Top, one of the major criteria includes, "building data systems that measure student growth and success, and inform teachers and principals about how they can improve instruction" (U.S. Department of Education, 2011). Both No Child Left Behind and Race to the Top have pushed data-driven decision making to the forefront of state, district, and school-level priorities

The emphasis on data-driven decision making has prompted many school districts to develop organized systems of data collection and reporting in order to support school leaders and teachers in data-driven decision making practices (Levin, Datnow, & Carrier, 2012; Foley & Sigler, 2009; Protheroe, 2001; Datnow, Park, & Wohlstetter, 2007;

Togneri & Anderson, 2003; Timperley & Parr, 2007). Earl and Katz (2006) state, "The advent of high-profile accountability policies has likely functioned as an extrinsic motivator, encouraging engagement with an agenda (in this case data-driven decision making) that might otherwise remain in the background" (p. 7). Federal and state emphasis on data-driven decision making has not only added increased pressures on schools to comply and develop systems for data use, but also assumes that schools and school leaders already know how to use data to make decisions and inform practice (Earl & Katz, 2006). According to Earl and Katz (2006):

> The "theory of action" underlying large-scale reform policy agenda like No Child Left ...is that once schools have the necessary data, educators will be in a position to diagnose areas of strength and areas in need of improvement. They will then adjust structures and practices in ways that will impact positively on student learning and this, in turn, will lead to enhanced student achievement for all students. Thus, the capacity requirement underlying such policies is that educators know how to use data in order to make the necessary consequent decisions. (p. 7)

However, research on data driven decision making has shown that engagement in data-driven decision making varies across school districts, schools, and school leaders. In fact, the school context, the communities, and the districts in which they operate make a difference in how educators use data and the extent to which they use data (Sutherland, 2004; Wohlstetter, Datnow, & Parks, 2008; Sanders, 2009; Earl & Katz, 2006). Some of the factors influencing data-driven decision making include the school or school district's culture (Sutherland, 2004; Earl & Katz, 2006), availability of data (Togneri & Anderson, 2003), types of data (Datnow, Park, & Kennedy, 2008), incentives for data use (Datnow et al., 2007), and whether data use is supported system-wide (Togneri & Anderson, 2003).

Research on data-driven decision making has highlighted the importance of

having certain systemic and organizational factors in place to support the use of data in districts and schools. These factors have contributed to data-driven decision making practices and linked to positive outcomes for students. One of these factors includes having a district-wide focus on data use that systemically supports data-driven decision making practices throughout the district (Togneri & Anderson, 2003). Togneri & Anderson (2003) studied five high poverty school districts that showed significant improvement in academic performance and found that one of the common factors between these districts was their ability to engage in data-driven decision making. In this particular study, the school districts used data to hold schools accountable and monitor school progress. These districts gathered data on multiple issues, such as demographic information and satisfaction surveys, and tracked school and student academic performance. The districts also supplied data tools to schools, such as diagnostic tests, and provided support staff to assist with data-driven decision making at all levels in the district (Togneri & Anderson, 2003).

Research also points to the importance of individual *school* focus on data-driven decision making practices. LaRocque (2007) studied one particular middle school that was successful in closing the achievement gap and found that data-driven decision making was one of the factors that contributed to the school's success. LaRocque (2007) stated, "Among the main reasons the school has improved is the emphasis on a sensible, purposeful, and appropriate use of data to make decisions" (p. 159). Some of these decisions included identifying students who were falling behind on state benchmarks and developing interventions to address their academic needs. The school also used student discipline and attendance data as well as parent satisfaction surveys to make decisions on

the school's daily operations (LaRocque, 2007).

Although systemic and organizational factors play a significant role in data-driven decision making practices in terms of structure and support, other factors influence *how* educators actually use data to meet particular needs. Sanders (2009) found that the type of school and school community play a role in how schools engage in data-driven decision making practices. Sanders (2009) found that different types of schools in different contexts use data differently. In a comparative case study of nine schools, Sanders (2009) found that high poverty schools with students achieving at both high and low performance levels used data to target specific groups of students and curricular areas. These schools used data to try to raise state achievement scores by targeting students who would give them the greatest advance in achievement scores. For instance, if students were scoring at a "basic level" on achievement tests, the school was more likely to spend time on interventions for these students because their move to the next level of "proficiency" would give the school the greatest overall gain (Sanders, 2009). By contrast, in low poverty schools with students achieving at both high and low performance levels, data were used to examine all students in all subject areas. Sanders' (2009) study demonstrates that different types of schools focus on data differently in order to address specific problems or needs depending on their district, school, and community context.

Research on data-driven decision making thus far has predominantly focused on factors influencing data-driven decision making at the macro-level in terms of overall contexts, structures, supports, and systems in districts and schools. There has been limited research at the micro-level in terms of teacher practice and thinking around data

use. In one study, Datnow, Park, & Kennedy (2008) examined teacher practice at four urban high schools that were identified as leaders in data use. At these particular schools, they found that classroom teachers who engaged in data-driven decision making practices used a wide variety of assessment data, both formal and informal, as well as their own intuition about students to help gauge student learning (Datnow et al., 2008). Likewise, the school systems in which these teachers worked emphasized the importance of data-driven decision making and supported teachers by providing special training in data use. Although teachers at these schools were supported in their use of data, they still struggled with how to best use data to make instructional decisions. Datnow, Park, & Kennedy (2008) stated:

> Our sense from observing teachers' discussions about data led us to believe that there is a wide range in teachers' knowledge about what the data mean and how to accurately make sense of them. Future studies might examine the extent to which teachers can actually understand and use data. (p. 100)

Thus, classroom teacher engagement in data-driven decision making remains somewhat of a quandary. Little is known about the actual thinking behind what data are deemed useful to teachers and how these data may prompt changes in instructional practice.

Problem Statement

Data-driven decision making has become an important educational issue in the United States, primarily because of federal and state emphasis on school accountability and achievement. Data use has been highlighted as a key factor in monitoring student progress and informing decision making at various levels of the education system. However, the problem does not seem to lie in how to gather, collect, or disseminate data, given that there seems to be a wealth of data available to educators (Earl & Katz, 2006;

Wayman, 2005). Rather, the bigger issue seems to be about how educators decide on what types of data to use and how they actually use it. Earl and Katz (2006) stated:

> Education, like many other fields, is awash with data. Districts and states or provinces generate huge amounts of data, and many maintain data systems that offer a wealth of potential data about schools from test results to dropout statistics, attendance figures, course enrollments, teacher credentials, student demographics, and so on. Like many others in society, educators are trying to come to grips with this vast deluge of new and unfiltered information and to find ways to transform data into information, then into knowledge, and ultimately into constructive action. (p. 2)

Federal and state policies require educators to use data to inform decision making and the assumption is that educators already know how to analyze, interpret, and use data to make informed decisions. Research has been done at the district and school levels and several common factors have been identified as being important to creating an environment that supports data-driven decision making (Sutherland, 2004; Wohlstetter, Datnow, & Park, 2008; Earl & Katz, 2006; Togneri & Anderson, 2003; Datnow et al., 2008). However, little is known about how classroom teachers make decisions around data including how they choose which data are important, how they collect data, and how they use data to make decisions that influence their practice. Additionally, we do not know if the kinds of decisions that they are making with data are actually impacting instructional practice in the classroom. Datnow, Park, & Kennedy (2008) studied four high schools engaged in data-driven decision making and offered some insights to classroom teachers' use of data. However, they explained the need for further research on classroom teacher engagement with data-driven decision making. According to Datnow, Park, & Kennedy (2008):

> Although this study uncovered some important insights as to how data [sic] is used to inform instruction, additional research still needs to capture what data-driven decision making looks like at the classroom level. We were only able to

> conduct limited classroom observation in this study. A future study might focus on observing several classrooms in depth over a long period of time in order to see how the teaching of an entire unit might be influenced by the use of informal and formal assessments. Second, it would be useful to get a better sense of how teachers' levels of data literacy inform their instructional planning. (p. 100)

Thus, a closer examination of teacher practice around meaningful use of data is needed. Specifically, it is important to study how and why classroom teachers choose data and what decisions they make with these data that may impact their instructional practice. It is also important to examine engagement with data-driven decision making with teachers working in both similar and different school contexts.

Purpose of the Study

The purpose of this research study was to gain a deeper understanding of how classroom teachers engaged in data-driven decision making. I examined the kinds of data that six classroom teachers used, why they used these data, how they used data to inform their practice, and how they planned and adjusted classroom lessons in response to data collected. I investigated the variance across teachers in the same school context, receiving the same support and professional development, as well as compared teachers across different school contexts.

Research on data-driven decision making at the district and school levels have shed some light on data-driven decision making at the systems level. This research study contributed to our understanding about how classroom teachers used data to inform practice at the micro level. This understanding led to a better understanding of what data were useful for teachers as well as some of the challenges associated with data-driven decision making. This study also provided insight into the kinds of supports that teachers

need from both schools and districts and informed the kinds of professional development that may help develop teacher capacity around data use and instructional practice.

Research Questions

The following questions guided this study:

1. Why and how do select classroom elementary teachers choose specific data to inform their practice?
2. How are data being used by these teachers to make instructional decisions?
3. In relation to data use, what practices support instruction? What areas do these teachers seem to struggle with?
4. What accounts for the variations in this select group of elementary teachers' ability to use and make decisions around data within and across schools?

CHAPTER TWO

REVIEW OF LITERATURE

Data-Driven Decision Making Overview

The emphasis on assessment and accountability by federal legislation has increased the urgency for states, districts and schools to incorporate data systems and engage in data-driven decision making practices. The No Child Left Behind (2001) legislation requires schools to use data to provide information on academic assessments, adequate yearly progress (AYP), and teacher qualifications (U.S. Department of Education, 2006). More recently, the American Recovery and Reinvestment Act of 2009 lists the use of data systems as one of the key elements and reform priorities for K-12 strategic planning (U.S. Department of Education, 2009). Data use, and more specifically data reporting, has become highly political in that it is used to influence what is publically reported about the progress of education in states, districts, and particular schools. Although the collection of high quality data may serve to inform decision making at all levels of education, data may also reveal areas of weakness and/or failure leading to political embarrassment for states and districts (Henig, 2012). Thus, the pressure to improve academic achievement and collect data to show this improvement has influenced the overall educational landscape in the United States.

Federal focus on high stakes testing and data-driven decision making is meant to act as a lever to motivate districts and schools to improve teaching and learning for all students (Supovitz, 2009). However, implementing the systematic use of data can be a daunting task for districts and schools. Many articles and papers have been written to address these concerns providing educators with "how to" guides to the data-driven

decision making process (Simmons, 2012; Flowers & Carpenter, 2009; Hamilton, Halverson, Jackson, Mandinach, Supovitz, & Wayman, 2009). These guides outline the conditions that would best serve data-driven decision making practices and provide basic starting points for districts to follow. For instance, Simmons (2012) suggested that districts should have the following in place to support data-driven decision making: more and better data in the hands of teachers and principals; time for school staff to meet regularly to discuss data; professional development that strengthens educators' ability to make inferences (from the data) and develop supports and interventions; and tools and strategies that address individual school struggles and needs. Similarly, Flowers & Carpenter (2009) proposed five easy steps for data-based decision making in schools. These steps include the following: review the school's improvement plan, determine how data will be used, identify relevant data, examine and discuss data, set goals and evaluate progress. Hamilton et al. (2009) provided a data use practice guide through the U.S. Department of Education National Center for Education Evaluation and Regional Assistance. This practice guide is intended to provide a framework for using student achievement data to support instructional decision making. Hamilton et al. (2009) suggested that the types of decisions that can be made with data include adapting lessons to respond to student needs, altering classroom goals, modifying student grouping, targeting specific students, and prioritizing instructional time. The practice guide outlines five recommendations for educators and provides a checklist for each of the recommendations. The five recommendations are as follows: make data an ongoing cycle of instructional improvement, teach students to examine their own data and set learning goals, establish a clear vision for school-wide data use, provide supports that

foster a data-driven culture within the school, develop and maintain a district-wide data system. All of these types of guides simplify the data-driven decision making process for educators and help districts and schools plan how they might get organized around system-wide data use. Many of these guides describe data-driven decision making as a cyclical process, beginning with data and taking some form of action that would result in more data that would then be re-examined to inform next steps. Although the process described in the literature seems straight-forward, data-driven decision making can be quite complex with varying conceptions of what it means to use data amongst different educational stakeholders. The following section will describe some of these conceptions.

Conceptions of Data-Driven Decision Making

Research on data-driven decision making has shown that educators have varying conceptions about what data-driven decision making means and point to the complexity of interpretation, analysis, and actions taken by educators (Jennings, 2012; Mandinach, Honey, & Light, 2006; Coburn & Talbert 2006; Weiss, 2012). Data used at the district level, school level, or classroom level may serve different purposes and lead to different types of decisions (Moss & Piety, 2007; Jennings, 2012). Jennings (2012) categorized the varying purposes that data can serve. The first purpose is that data can act as a *lens*, meaning that data influence what educators perceive about the schools in which they work. Data as a lens may not necessarily lead to action, but data can at least influence what educators think about themselves and their organizations. Data can also serve as a tool for *diagnosis*, helping to identify problem areas and account for its causes. Data can serve as a *compass*, pointing the way to changes that may need to be made to the organization as well as to instructional changes in the classroom. Data can also be used

to assist educators with *monitoring*, giving information about specific students' performances over time and helping teachers gauge whether specific strategies, curriculum, or lessons worked. Finally, Jennings (2012) explained that data can be used as a *legitimizer*, helping to justify the decisions that were made in both the classroom and the school. These five categories of data use are examples of the many ways that data can be used to serve a specific purpose. However, it is difficult to say which one of these categories describes how educators perceive a given set of data and what actions result from their interpretations. Jennings (2012) stated:

> Researchers have spent much more time analyzing these test score data themselves than trying to understand how teachers use data in their work. What this literature review makes clear is just how scant our knowledge is about what teachers are doing with these data on a day-to-day basis. (p.20)

In an attempt to dig deeper into the complexity of data-driven decision making, Mandinach et al. (2006) provide a framework for the decision making process. Their framework is based on the assumption that individuals in the education system, regardless of what level in the school system, have issues and problems for which data need to be used in order to make informed decisions. Mandinach et al. (2006) described six cognitive skills that lead educators from raw data to knowledge, thus resulting in some type of decision and impact. These skills include the following: collect, organize, analyze, summarize, synthesize, and prioritize. They claim that these cognitive skills are used in the decision making process with a given data set at each level of the organization. However, Mandinach et al. (2006) point out that the type of data that is useful for educators vary and that data needs are different at different levels of the organization. They stated, "For assessment data to be useful for instructional planning, they need to be current, accurate, and in the hands of knowledgeable decision makers at

the appropriate levels" (p. 3). Test data, for instance, are much more aligned to administrative use by showing test trends and patterns, but more limited in the kind of information that teachers may need to inform instruction. Teachers, on the other hand, prefer multiple sources of data that include homework and anecdotal data that reflect classroom performance (Mandinach et al., 2006). Thus, the type of data administrators and teachers choose to collect, organize, analyze, summarize, synthesize, and prioritize may be different and used to serve different purposes.

Along the same lines, Coburn & Talbert (2006) claimed that individuals have varying conceptions of what data constitute as *valid evidence* and that these varying conceptions influence how individuals respond to data-driven decision making demands. Coburn & Talbert (2006) explained:

> A central argument behind policy promoting evidence-based practice is that evidence of student learning should be used to evaluate and improve educational programs and practices. However, what people take as valid evidence of student learning is likely to shape how they envision this process and how they respond to pressures to enact it. (p.474)

Coburn & Talbert (2006) claimed that individuals' conceptions of *valid evidence* are related to organizational and institutional contexts and vary according to the nature of the individual's work within the organization. For instance, teachers were more likely to see data that demonstrated student thinking, student reasoning, and/or teacher judgment as valid evidence. However, administrators or district office personnel who are more concerned with accountability may view test scores that generalize a school's overall performance as valid evidence. In both cases, individuals' conceptions of valid evidence are based on the demands and needs of their specific role within the organization. Teachers need data that will help them understand student learning and provide

information that will inform instruction. Central office administrators need data that will give them an overall picture of how schools are performing across the district. This research has implications for what is expected at various levels within educational organizations in terms of data collection and data use. Coburn & Talbert (2006) explained the need for a coherent strategy for evidence based practices in the following statement:

> First, our research suggests that moving toward a coherent systemic strategy for evidence based practice may require a system of evidence use that allows for and supports access to different kinds of evidence for different purposes at different levels of the system. Individuals with different work roles have substantively different data needs. A strategy for evidence-based district reform must acknowledge these differences and create mechanisms to bring productive dialogue and coordination across them. (p.491)

These differences have implications for both policy and practice within the education organization in terms of the expectations for data use. The expectation for data-driven decision making practices at different levels must account for differences in educator needs. Developing a system to promote data-driven decision making practices must therefore consider the practical data needs for administrators as well as classroom teachers and collect data that provide educators enough information to act upon.

Not only must educators consider the differences in types of data, they must also consider the *goal* of data. Weiss (2012) explained that there is a significant difference between *data for accountability* and *data for improvement*, having implications for designers of data systems. Weiss (2012) described data for improvement as data that would help teachers and principals do a better job of instruction in order to enhance student learning. Data for accountability, on the other hand, would measure and report outcomes that would assess whether the investment of taxpayer resources has produced

desired educational outcomes (Weiss, 2012). The differences in data goals require different environments. Data for improvement require a supportive environment. Weiss (2012) described this environment as the following:

> The designers of data systems can encourage the likelihood that teachers and principals will use data for improvement by attending to these features: providing human support to help teachers translate data into meaningful guidance; making data easily digestible; avoiding fears of evaluation and judgment by reducing the transparency of data reporting; creating respectful and supportive collaborations to support data use by individual teachers; and directing data to teachers and administrators who have direct control over the curricular and instructional choices that lead to student learning. (p.3)

The goal of data for accountability, on the other hand, is to put pressure on teachers and principals by using data about schools that lead to incentives or sanctions. This type of environment is more judgment-oriented, requiring principals and teachers to account for their actions and student performance results. Weiss (2012) explained that the differences in the two types of data goals lead to differences in the design of data systems in the following way:

> The selection of measures of school performance, the transparency and disclosure of data, the level of aggregation at which data are reported, the training in the use and analysis of data, the frequency of data reporting, and the kinds of support and follow-up are all likely to vary depending on the goal. (p. 6)

This research is significant in that it points out that the overall purpose and goal of collecting data affects how educators will engage in the entire data-driven decision making process.

Thus far, different aspects of the *types of data* as well as the *purposes of data* have been discussed. However, the next level of analysis is how educators think about what it means to be engaging in data-driven decision making. Research has found that educators can mean very different things when they claim to be engaging in data-driven

decision making practices (Ikemoto & Marsh, 2007; Mandinach, 2012). For instance, some educators describe data-driven decision making as using test scores to find areas of weakness and then targeting additional resources to those areas. Others describe a more complex process of using multiple data sources to determine trends, patterns, and causes of specific data and then determining next steps (Ikemoto & Marsh, 2007). While both examples show educators engaging in data-driven decision making, their processes differ in complexity. Ikemoto & Marsh (2007) thus conceptualized data-driven decision making in terms of the type of data, ranging from simple to complex, and the process of analysis and decision making, ranging from simple to complex. They described simple data as one dimensional, highlighting a particular aspect of what is being measured. Whereas, complex data would provide information from multiple sources and provide information that is multi-dimensional. Simple analysis and decision making would be straightforward in nature while complex analysis and decision making would be more inquiry-oriented, posing questions about causes and effects and determining next steps and leading to further questions about what data might mean. The relationship between simple and complex data and simple and complex analysis and decision making is illustrated in four quadrants, where educators may be engaging in any one of these quadrants at any given time. (For instance, educators may examine complex data but engage in simple analysis.) Their description is particularly significant because it points out the relationship between various types of data and the variation in data-driven decision making processes that educators engage in when analyzing and interpreting data.

The literature has described different types of data used to serve different purposes and has attempted to conceptualize the thinking processes behind decision

making. However, how data translate into teacher action is what will ultimately impact student performance. Mandinach (2012) defined teachers' ability to transform data to instructional action as *pedagogical data literacy* and that a key component to data-driven decision making is to build human capacity around data literacy. Mandinach (2012) explained that data-driven decision making is not a new concept for educators. Mandinach (2012) claimed:

> I maintain that effective teachers and administrators have been using data for many years, but the process was neither systematized nor automated. Teachers scan their classes for signs of understanding or misconceptions. They ask questions. They observe their students. They examine student work products. All of this is DDDM [data-driven decision making]. (p. 72)

Teachers with pedagogical data literacy are able to interpret data and relate data back to classroom instruction. Simply interpreting the data and knowing what needs to be done is not sufficient. Teachers must have the ability to act on this knowledge. However, little research is available on how teachers act on data and engage in data-driven decision making practices.

This section described the varying conceptions of data-driven decision making and its complexity. This included the purpose of data, the types of data, and the process of decision making. The next section briefly presents some of the literature that demonstrates *why* data-driven decision making is a key area of focus for educators and policymakers.

Rationale for Data-Driven Decision Making

Focal Point for Educators

Although federal and state legislation call for the use of data, it is not the only driver to data use. It is important to understand the rationale behind data use and

examine some of the research that points to data-driven decision making as a key factor in improving student achievement. Earl & Katz (2006) argued that the use of data is important for overall good decision making and allows educational stakeholders to focus their conversations. Earl & Katz (2006) warned, "When policy makers and school personnel either ignore data or rely upon inadequate data, they run the risk of making poor decisions" (p. 6). When data are seen as a tool for educators, the data can serve as a focal point to move the educational community towards common goals. Earl & Katz (2006) stated:

> Instead of being a point of contention, data can provide the vehicle for moving the community forward in ways that strengthen the bonds of shared vision and forge the relationships needed to serve that vision. Accountability and data are right in the center of the conversation, not as instruments of naming and blaming but as the grist for discussing policies and practices in conversations that nourish the collective will for action. (p. 13)

Data use can be seen as part of a process of analysis, discussion, and reflection, ultimately leading to a change in practice. Data provide a picture of a current problem or issue and allow educators to focus their plan of action (Earl & Katz, 2006).

Improved Student Achievement

One of the main rationales behind data-driven decision making is that it is linked to improved student achievement. Several studies have been done at the district and school levels showing that data-driven decision making is a key factor in raising student achievement (Togneri & Anderson, 2003; Supovitz & Taylor, 2003; Marsh, Kerr, Ikemoto, Darilek, Suttorp, Zimmer, & Barney, 2005) as well as closing the achievement gap (LaRocque, 2007). At the district level, Togneri & Anderson (2003) studied five high poverty districts that had demonstrated improved academic achievement across grade levels, races, and ethnicities. Upon examining these districts in depth, they found

that one of the common factors between these five districts was that all of them were engaged in some form of data-driven decision making. These districts acknowledged their poor performance called out by data and were willing to systematically improve instruction to address these problems. All of these districts put in place some type of system-wide use of data to inform their practice and held schools accountable for their results. All levels of the district including board members, principals, teachers, and central office staff used data to guide their decision making (Togneri & Anderson, 2003).

Data-driven decision making has also been linked to improved student achievement through district-wide reform efforts. Supovitz & Taylor (2003) studied a standards-based, district wide reform effort in Duval County, Florida and found that data-driven decision making practices were an integral component of improving student achievement over the four years of the study. Specifically, district and school leaders regularly examined data to inform intervention and assistance strategies for students who were not meeting standards. Districts were also informed by a county-wide monitoring system that tracked schools' progress towards meeting standards-based goals (Supovitz & Taylor, 2003). Similarly, Marsh et al. (2005) studied three urban school districts' efforts to improve teaching and learning and school performance. In all three districts, one of the main areas of focus was promoting the use of data to guide instructional decisions through professional development and promoting structured examination of student work. Marsh et al. (2005) found that all three district reform efforts had promising implications for improving student achievement. Although the districts promoted data-driven decision making, they varied in the kinds of strategies they used to promote data use. One district focused on data-driven decision making as a part of their School Improvement Planning

(SIP) process. At this district, administrators encouraged schools to examine state data and confirm these results with other types of assessment data to identify areas of need and determine strategies to address these needs. This district supported the SIP process through professional development, school coaches, and district site visits. The district also provided schools with a SIP template intended to serve as a guide in their planning. Principals and teachers in this district found various sources of data useful and used them regularly in their decision making processes. Another district involved in this study engaged in data-driven decision making by focusing on the use of interim assessments linked to a data management system. The interim assessments were given to all grade levels and designed to gauge their progress toward meeting state standards. The data management system allowed for timely access to detailed assessment results as well as customized additional assessments. Teachers and administrators found the interim assessment data useful and reported using them regularly to make decisions. These decisions included targeting students in need as well as identifying teachers and schools requiring additional support (Marsh et al., 2005). In both of these district studies, data-driven decision making as part of large-scale district reform efforts seemed to have implications for improved student performance (Supovitz & Taylor, 2003; Marsh et al., 2005).

At the school level, LaRocque (2007) studied one particular middle school in Florida that not only raised achievement over a short period of time, but also successfully closed the achievement gap at the school site. This school was part of an urban, economically disadvantaged district and had a culturally and linguistically diverse student population. LaRocque (2007) examined the factors contributing to the school's success,

with one of the factors being that the school engaged in data-driven decision making practices. Specifically, this school used data from state benchmarks to make school site decisions. The school was able to identify and target students who were not performing up to par on state assessments. The school then developed a clear plan for these targeted students and offered immediate remediation and instruction based on the information gathered from the state benchmarks (LaRocque, 2007). Data use in this case highlighted the need to improve support and instruction for all students, particularly those who have traditionally been "left behind" and focused school efforts in closing these gaps.

Data Can Change Mission, Motivation, and Thinking

Focus on the importance of using data for accountability and assessment has forced school leaders to examine data more closely, specifically data that highlight the performance of traditionally underserved students. Several articles have been written describing how data use can change the mission of schools (Stiggins, 2005) as well as change the thinking and motivation of school leaders (Skrla & Scheurich, 2001). Skrla & Scheurich (2001) found that the high stakes accountability environment displaced deficit thinking in school leaders, specifically district superintendents. Deficit thinking can be defined as a view that children from low income homes and children of color are somehow responsible for lower student achievement in schools and that this view has been common and longstanding amongst educators (Skrla & Scheurich, 2001). Skrla & Scheurich (2001) explained:

> The result of this pervasive deficit approach is that students from low-income homes and students of color routinely and overwhelmingly are tracked into low-level classes, identified for special education, segregated based on their home languages, subjected to more and harsher disciplinary actions, pushed out of the system and labeled "dropouts," underidentified as "gifted and talented," immersed in negative and "subtractive" school climates, and sorted into a plethora of

"remedial," "compensatory," or "special" programs. (p. 236)

Skrla & Scheurich (2001) studied four Texas school districts that showed significant improvement on the Texas state achievement tests for students coming from low income homes and for students of color as well as closed the achievement gap. The Texas accountability environment influenced the views and actions of district superintendents by using data to call out the inequitable differences amongst different subgroups of students and forced districts to take action to address these concerns. Data identified the need to look deeper into instructional practices that would serve all students. Skrla & Scheurich (2001) claimed that the accountability and assessment environment was responsible for displacing deficit thinking that existed in these districts and summarized their findings in the following ways. First, accountability makes educational inequity highly visible and irrefutable. If children were not being served equally well or benefiting from the programs the district offered, the district could no longer make excuses for these gaps. Second, Texas state accountability reduces risks for district leaders. Confronting issues of race and class inequity can be highly political for district and school leaders. Calling out these inequities and addressing them as a state requirement shifts the focus away from district leaders and possible political controversy, making it easier for district leaders to address these issues head on. Third, accountability forces superintendents to look for successful examples of schools, classrooms, and teachers who have been able to close the achievement gap. District leaders' attention thus shifts to improving instructional strategies rather than on managerial issues. Fourth, accountability helps to develop anti-deficit leadership orientations. Skrla & Scheurich (2001) found that the way superintendents articulated their mission and goals to their

principals, teachers, and staff reflected anti-deficit thinking. For instance, mission statements would include belief statements about believing that all students could learn and should be provided with the opportunities to demonstrate their learning. Finally, Skrla & Scherich (2001) claimed that accountability drives successively higher expectations. As all groups of students began to improve in academic performance, there were continuous rising expectations for what students were able to do. This expectation did not only apply to state assessments but also transferred to other areas of schooling such as expectations for higher college admissions scores or more students enrolled in rigorous course (Skrla & Scheurich, 2001).

Similarly, Stiggins (2005) claimed that assessments, accountability, and data use have changed the mission of schools. Whereas in the past, assessments have been used to sort and rank students, assessments are now used to serve a different purpose. Stiggins (2005) explained:

> We have discovered that students in the bottom one-third to one-half of the rank order- plus all who drop out before being ranked- fail to develop the foundational reading, writing, and mathematics proficiencies needed to survive in, let alone contribute to, an increasingly technically complex and ethnically diverse culture. So today, in asking schools to leave no child behind, society is asking that educators raise up the bottom of the rank-order distribution to a specified level of competence. (p. 325-326)

Thus, the mission of schools is now making sure that all students perform to a particular academic standard set forth by each state. Stiggins (2005) went on to explain how multiple forms of data must be used to provide knowledge about students' progress toward meeting standards. Stiggins (2005) stressed that these data shared with students can affect their thinking about what they can do and motivate them to perform to higher levels of achievement. These findings are significant because they show how political

context and pressures regarding accountability and data-driven decision making could act to change the thinking, beliefs, and motivation of educators and students.

The rationale behind data-driven decision making not only helps educators plan a more focused course of action, but also has been linked to increased student achievement and closing of the achievement gap. Additionally, the focus on assessment, accountability, and data can influence the mission, motivation, and thinking of educators and students and raise the expectations of student performance as a whole.

Factors Influencing Data-Driven Decision Making

Datnow, Park, & Kennedy (2008) stated, "High performing schools and school systems use student data in all facets of their work to continuously inform and improve their instruction" (p. 5). A review of the literature on data-driven decision making reveals several common factors that seem to be important for effective data-driven decision making at districts, schools, and classrooms. These five factors include the following:

1. A culture of data use needs to be established (Sutherland, 2004; Datnow, Park, & Wohlstetter, 2007; Earl & Katz, 2006; Datnow, Park, & Kennedy, 2008; Noyce, Perda, & Traver, 2000)
2. Clear systems for data use need to be in place (Levin, Datnow, & Carrier, 2012; Foley & Sigler, 2009; Protheroe, 2001; Datnow et al., 2007; Togneri & Anderson, 2003; Timperley & Parr, 2007)
3. Supports and resources need to be available to those engaging in data-driven decision making (Means, Padilla, & Gallagher, 2010; Marsh, 2012; Datnow et al., 2008; Lachat & Smith, 2005; Marsh, McCombs, & Martorell, 2010;

Turner & Coburn, 2012)

4. Data collection and dissemination that meet needs of data users (Weinstock, 2009; Lachat & Smith, 2005; Breiter & Light, 2006; Brunner, Fasca, Heinze, Honey, Light, Mandinach, & Wexler, 2005; Ysseldyke, Spicuzza, Kosciolek, Teelucksingh, Boys, & Lemkuil, 2003)
5. Context matters (Honig & Coburn, 2008; Sanders, 2009; Williams, 2011)

Culture

Earl & Katz (2006) discussed the importance of establishing a school culture around data-driven decision making. They stated:

> School leaders have little chance of using data unless the school as a whole is also committed to being a community, routinely challenging existing beliefs and practices, and using data to make sense of their environment and to think about their future. This means a dramatic shift in mind set for the whole school so that data become a core part of school culture (Earl & Katz, 2006, p. 20).

Sutherland (2004) examined one particular school where data-driven decision making was a central part of the school culture and had become a daily part of the school's work. The particular school in this research study was an Edison Project School. Sutherland (2004) emphasized that the culture of the school, which was based on Edison Project Schools' focus on data use, supported a data-driven environment and that teachers at the school site had bought-in to the schools' emphasis on using data to make instructional decisions. For instance, teachers used a benchmark system as a tool for monitoring student performance. The benchmark system was based on fifteen questions in reading, language arts, and mathematics and gave teachers immediate feedback about student performance both on an individual student level and on a whole class level. This system allowed teachers to immediately plan and adjust instruction. According to

principal and teacher interviews, the staff commented on how the data from the benchmark system helped them to regularly track how students were performing and felt that their students had shown improved academic achievement. Sutherland (2004) found that the teachers supported the use of data and were willing to engage in data-driven decision making practices. The school's culture reflected the routine use of data as a part of the way the school conducted business and part of the expectations around their work.

Datnow et al. (2007) looked at the work of four different school systems (two districts and two charter management organizations) that used data to improve student achievement over time. Again, one of the common factors between these four school systems was that they established a culture of data use and continuous improvement. School leaders established this type of culture by creating norms and expectations around data-driven practices. They did this by stating explicitly that data use was non-negotiable and set expectations for how meetings regarding data were to be conducted, including what materials to bring, how to act, and what work was to be done during these meetings. Additionally, a culture of data use was fostered by establishing a safe, no blame school environment where data were non-threatening. Datnow et al. (2007) offered the following example:

> Aldine leaders at multiple levels express the belief that data needed to be dealt with in an environment filled with trust. Part of using data effectively required developing a process where data are discussed openly, without fear of repercussions. The superintendent admitted that this takes "courage" and so she frames data not as a game of "gotcha, you're doing a poor job," but as an acknowledgment that instructional strategies for groups or specific students are not effective. As noted by the superintendent, staff members needed to "trust that their world would not end if their data were bad, or if they made a bad decision." She feels that developing a sense of trust is a "top-down, bottom-up, side-by-side" process, with the goal that principals and teachers feel comfortable in coming to meetings to share data. (p. 26)

These norms and expectations around data-driven decision making were designed to enhance mutual accountability at all levels of the system. Data-driven cultures were also created and established by each school's hiring practices. Overall, the schools tried to hire staff that shared the same beliefs about using data (Datnow et al., 2007), although this was somewhat easier for the charter schools given that they have more autonomy and less restrictions on hiring practices.

In a different study, Datnow, Park, & Kennedy (2008) found that a district culture that emphasized the importance of data use to inform instructional practice was critical and that this culture influenced teachers' belief systems around data use. Teachers believed that using data helped them to stay focused around student learning and performance rather than on other issues. Teachers in these districts believed that using data helped them do a better job at addressing students' academic needs (Datnow et al., 2008).

Another aspect of creating a data-driven school culture is to establish a positive outlook towards using quantitative data (Noyce, Perda, & Traver, 2000). More specifically, a data-driven culture must have individuals who are willing to use numbers regularly and systematically across the district. Noyce et al. (2000) explained that in a data-driven culture, there is an "institutionalized willingness to use numbers systematically to reveal important patterns and to answer focused questions about policy, methods and outcomes" (p. 53). Noyce et al. (2000) highlighted several factors in establishing this type of data-driven culture. First, establishing the regular use of data as a part of the school culture requires technical, financial and human support in terms of collecting and distributing data as well as developing human capacity to analyze and

interpret data. They argue that this support must come from the state, district, and outside partnership organizations. Second, data-driven cultures must be both localized and systemic, meaning that teachers must inform those who are collecting and distributing data as to the kinds of data needed to inform instruction. Third, data-driven cultures require data teams and individuals who are trained and have the capacity to support the rest of the district in the use of data to make decisions about programs, curriculum, instruction, and resources (Noyce et al., 2000).

These research studies highlight establishing a culture around data use as an important factor in supporting data-driven decision making practices. This kind of culture is established by articulating explicit norms and expectations around data use throughout the organization, fostering teacher belief systems, and systematically supporting and using data to make decisions.

Clear Systems

Not only is it important to have culture that promotes data use, there has to be an organized way of using data throughout the whole educational institution. A second essential factor that supports the use of data-driven decision making is having clear systems in place. These systems may be in the form of policies, accountability procedures, ways of collecting and disseminating data, and supports for data use. In short, having clear systems in place to support data-driven decision making means that there is a plan for data use that is articulated and implemented across the whole educational organization.

The Education Commission of the States (2002) found that exemplary districts across five states all had systems for data-driven decision making in place. They

collected different types of data (demographic, achievement, instructional, perception) and used data to inform their school improvement planning processes. Districts also used data to inform resource allocations and making decisions on intervention strategies. These exemplary districts incorporated data-driven decision making practices into their daily work and had expectations for how data was to be used throughout the school system. As part of research conducted for the Education Commission of the States, Armstrong & Anthes (2001) published a list of recommendations for states, districts, and schools that highlight some of the important factors for creating clear systems of data use. Some of the recommendations include having data-driven school-improvement processes, district staff that support schools and principals, principal leadership that encourage the use of data within the school, a mechanism for collecting and disaggregating data quickly, and having a person at each school site whose job is to manage and support data use (Armstrong & Anthes, 2001).

Many research studies have been done on school districts that have increased student performance. These studies have found that successful school districts have clear systems of data use in place and have highlighted data-driven decision making as one of the key factors in their success (Levin, Datnow, & Carrier, 2012; Foley & Sigler, 2009; Protheroe, 2001; Datnow et al., 2007; Togneri & Anderson, 2003; Timperley & Parr, 2007). For instance, Levin et al. (2012) claimed that high-performing school districts, defined as districts that have improved student outcomes, have certain characteristics that have helped them support student-centered learning approaches and solidify reform efforts. These characteristics include focusing on goals, curricular alignment, use of data, instructional leadership, professional development, developing partnerships, and creating

a culture for change (Levin et al., 2012). Similarly, Foley & Sigler (2009) described how "smart districts" use data systemically. A major part of the Annenberg Institute's Smart District Framework is the use of data for accountability and continuous improvement (Foley & Sigler, 2009). They claimed that data-driven decision making should be a part of the systemic effort of districts and schools. Foley & Sigler (2009) explained:

> To achieve results, smart districts need to know current and past results and what they have to do to improve those results. Districts and their partners need to develop sophisticated and user friendly data collection and analysis systems that enable them to monitor the performance of young people, schools, programs, personnel, and the partners themselves against the results they expect. Smart districts integrate not only the collection of data, but also the serious and regular examination of data into the normal operating procedures of schools and districts. (p. 8)

Foley and Sigler (2009) proceeded to give a list of recommendations to district leaders on how to create clear systems that support data-driven decision making. These recommendations include monitoring outcomes for students, schools, and district personnel as well as evaluating the effectiveness of implemented programs and ensuring technology that support the effective and timely use of data.

Protheroe (2001) highlighted districts that used data to improve student achievement and also found that these districts had systems in place for data use. These systems included the following components: asking the right questions, having a way of collecting and analyzing data, responding to data, and providing support for staff. A key finding in this study is the emphasis on asking the right questions at different levels- district, principal, and school. These questions may differ depending on the type of decisions that need to be made at each level. Data also need to be available and in a format that helps address the questions asked at each level. These data need to be easily disaggregated, provide a detailed analysis of results by objective or skill, and used

regularly (Protheroe, 2001). Protheroe (2001) also found that responding to data involves aligning the curriculum to the assessments, improving teaching strategies, and providing special instruction to students who need it. Finally, schools need to have the opportunity to learn how to analyze data through professional development, presentations, and on-site support (Protheroe, 2001).

Similarly, Datnow et al. (2007) found that clear systems were in place at four different school systems that were successful in using data to make decisions. Their findings highlighted the following components: having information management systems, selecting the right data, and analyzing and acting on data to improve performance (Datnow et al., 2007). These school systems invested in information management systems as well as expert personnel who supported the use of these systems. The information systems provided timely and accurate data in a way that was accessible to users. They also used data that provided information for multiple purposes- including instructional and curricular decisions. Finally, they developed tools to help educators act on data and provided timely feedback to schools on student achievement. All of the school systems had some type of data analysis protocol that assisted in this work (Datnow et al., 2007).

In a study of five districts that raised student achievement in high poverty schools, Togneri & Anderson (2003) found that they were effective in data-driven decision making because they implemented a systematic way of using data that included the following: making data safe, making data usable, and making use of data. Making data safe meant that district and school leaders were willing to accept the information that the data revealed, good or bad, and embraced data as a tool to help them improve. Thus, the

district and school leaders modeled a willingness to share information and seek solutions to problem areas. District leaders were also thoughtful in how they were going to make data usable for principals and teachers by providing data and data analysis tools that were easy to access and understand. Finally, the third component, making use of data, meant that the districts offered professional development designed to help teachers with data-driven decision making practices (Togneri & Anderson, 2003). These districts made conscious efforts to promote data-driven decision making by developing clear strategies that took into account the data users, primarily the principals and teachers.

Perhaps one of the most detailed descriptions of having clear systems in place that promote data-driven decision making comes from a research study in New Zealand. Timperley & Parr (2007) described the systemic and coherent use of evidence throughout a national educational reform process. The Ministry of Education in New Zealand implemented a reform effort to increase the performance of the bottom twenty percent of students in ninety-one schools across the country. The Ministry of Education brought in outside literacy experts to facilitate learning for teachers and leaders. The reform effort focused on systemic inquiry and learning at every level of the system including students, teachers, school leaders, facilitators, as well as the Ministry of Education. Data-driven decision making was a key focus of their efforts. Timperley & Parr (2007) described the use of evidence in the following way:

> Interactions at all levels of the project centered on evidence. This evidence could include evidence of student learning from assessments and interviews, evidence of teacher practice from observations and their knowledge from their written responses to a hypothetical lesson scenario, evidence of school leadership practice from observation of meetings, or evidence of facilitator practice from feedback sessions and teacher responses. Evidence was used to hone practice to achieve outcomes. The evidence served two important functions. The first was to identify learning needs of participants at the different levels, and the second was

> to determine the extent to which those learning needs had been met. In keeping with these functions, initial work by facilitators in each school focused on obtaining evidence to undertake an analysis of both student and professional learning needs. As the project developed, professional meetings were observed to identify leadership needs in this area. These data were intended to be used to plan professional learning. (p. 106-107)

All of the districts described in this section made data-driven decision making a priority, with expectations about data use at various levels within the organization. All of the districts had some way of systematizing the work involved with data-driven practices and had clear and organized pathways of data use that educators could follow. The benefit of this research shows that when districts and schools have clear pathways in place for data-driven decision making practices, educators are better supported in their use of data to make informed decisions.

Supports and Resources

Districts and schools that effectively use data have many supports and resources in place to assist educators in data-driven decision making. The many different ways to support data-driven decision making vary from comprehensive systems level initiatives to more narrowly focused teacher supports and workshops. Common district strategies for building capacity around data-driven decision making include professional development activities, support staff to assist with data use, and tools for generating and acting on data. Other resources may include developing partnerships with outside organizations to support data-driven decision making implementation (Means, Padilla, & Gallagher, 2010). Marsh (2012) categorized these different kinds of interventions and supports into the following five domains: human support, technology support, data production, accountability and incentives, and norms and expectations. Human support includes professional development, coaching, tools, technical expertise, and networking (Marsh,

2012). Marsh (2012) explained that the key aspects of effective supports for data-driven decision making are the following:

> Regardless of whether an intervention is designed as a part of a comprehensive reform initiative or as a stand-alone professional development effort, some evidence suggests that the process thrives when interventions ensure that data are easy to understand and usable; include norms and structures promoting the safety and confidentiality of data and data discussions; target multiple leverage points; and involve opportunities for cross-site (or level) collaboration. (p. 35)

Schools may also find creative ways for supporting data-driven practices by leveraging the roles and responsibilities of existing staff. For instance, in a study of four effective urban high schools, Datnow et al. (2008) found that the districts invested significant resources toward using data to improve instructional capacity. One of the supports the districts invested in was enabling school leaders, such as teacher department chairs, to assist other teachers with the use of data. These teacher leaders observed fellow teachers in their classrooms and assisted them with data analysis in order to shape instruction. They supported teachers in their efforts to become more open about using data to inform their work (Datnow et al., 2008).

Supports can also come from hiring additional staff, such as teacher coaches with full-time responsibilities of assisting teachers with data-driven decision making and instructional practice. Several studies highlighted the role of teacher coaches in helping with data use at school sites. For instance, Lachat & Smith (2005) examined five urban high schools undergoing comprehensive school reform, with data use as a key component of these reforms. They found that the high schools that were most effective in data use had administrators, teacher leaders, as well as teacher coaches that supported the use of data throughout the schools. The responsibilities of the data coach included providing assistance and addressing data-quality issues, improving the use of data for school-wide

planning, modeling how to focus data around critical questions, and using data to monitor student performance. Lachat & Smith (2005) also described how coaches played an important role in motivating and keeping teachers focused around data-driven decision making. As teachers began to take on data-driven decision making practices and develop a greater understanding of data use, the role of the coaches decreased. Lachat & Smith (2005) explained:

> The data coach was a coach in the true sense in that various uses of data were modeled, but school staff were responsible for the analysis and interpretation of the data. Documentation of how the schools used the coaching assistance shed light on the importance of the coaching role in helping school staff with limited previous experience in data analysis develop the skills to use data effectively. (p. 344-345)

Similarly, Marsh, McCombs, & Martorell (2010) examined the role of instructional coaches in middle schools from eight large districts in Florida. The role of these particular instructional coaches was to improve students' reading ability by helping teachers with instructional practice. Although the coaches in this study were not specifically hired to address data-driven decision making as their primary goal, Marsh et al. (2010) found that data support was one of the activities to which coaches devoted time, especially if they were more experienced coaches or were working in low-performing schools. They also found that the majority of instructional coaches focused on analyzing data to guide teachers' practice. For instance, coaches presented data to teachers at school-wide meetings to help determine areas of need or assisted individual teachers in analyzing assessment results to determine instructional strategies. The coaches also received training and professional development on data-driven decision making from the districts. The results from this study indicate that data analysis support from the coaches had a significant association with perceived improvements in teaching

and higher student achievement (Marsh et al., 2010). Thus, teachers believed that the coaches were helping them improve their work. These research studies highlight the importance of supports and resources in promoting and sustaining data-driven practices, especially if these supports are in the way of instructional coaches who are available to teachers on a daily basis.

Although the literature highlights many forms of supports and resources that aid in data-driven decision making practices, Turner & Coburn (2012) pointed out that there are limitations to the existing literature on data use interventions. Turner & Coburn (2012) explained that there is an assumption that if educators have the right data and are supported with data use in the right ways, this will result in better educational outcomes. However, there is little empirical research that links the process of data use with the outcomes of data use. They explained that the literature mostly focuses on description and prescription, but does not link educational outcomes to these approaches. They recommended that more rigorous research needs to be conducted that makes this connection (Turner & Coburn, 2012).

Data Collection and Dissemination

Another key factor influencing data-driven decision making is data collection and dissemination. In order to assist schools in data use, data collection and dissemination need to be timely, address a variety of educational issues, and be organized in a way that allows practitioners to focus on analysis and interpretation of data to inform their work (Weinstock, 2009; Lachat & Smith, 2005; Breiter & Light, 2006). Particularly, Lachat & Smith (2005) recommended that districts and schools should collect and update student data to ensure accurate and timely collection, storage, and analysis of essential data.

The literature highlights many examples of data collection and dissemination that have been helpful to districts and schools. For instance, Weinstock (2009) followed the work of two school districts, Chicago Public Schools and Texas Plano Independent School District, around data-driven decision making. Both school districts focused on becoming data-driven organizations that would help to improve instructional practices and student achievement (Weinstock, 2009). The Plano School District provided data from state tests and also information about students' cognitive abilities, which in turn helped schools and teachers understand students' reasoning skills. The Plano District used both formative and summative assessments to gauge student learning and personalized instructional strategies for individual students based on the data that they collected and analyzed. Chicago Public Schools, on the other hand, put a new enhanced data system in place that stored all student data in one location and allowed users to hone in on information at the granular level. The idea behind this data system was to put in place a useful tool for principals (Weinstock, 2009). In both of these districts, data were collected and mined at the district level and then disseminated to schools, relieving some of the burden for individual schools.

Some of the literature around data collection and dissemination focuses on the data systems themselves. In a review and study of management information systems, Breiter & Light (2006) highlighted several critical factors for the development and implementation of effective information systems for schools. These factors include building from the real needs of classroom and building educators, recognizing teachers' wealth of tacit knowledge as a starting point, and selecting appropriate data to include in the information systems (Breiter & Light, 2006). The point here is that designers of data

systems need to take into account the needs of the educators and collect and disseminate data in ways that would help them do their work more effectively. Brunner, Fasca, Heinze, Honey, Light, Mandinach & Wexler (2005) gave an example of a data system designed to disseminate data based on user need. This particular data system used data from state tests and disseminated the data in many forms for different users throughout the district. The data reports for teachers gave teachers information on strengths and weaknesses of individual students, grouped students in accordance with learning needs, and overall class performance. The reports for principals included an overview of the school and grade level, class level, and student level data. There were also reports generated for parents that included information about the goals of the test, summary of their child's performance, and suggestions for ways they could help their child. The data system also generated web-based tools for teachers that provided suggestions for instruction (Brunner et al., 2005). Brunner et al. (2005) explained, "The reports recognize...that data mean different things to people in different roles, that the process of turning data into information is different for parents, students, teachers, and administrators because the kinds of decisions they make are different" (p. 246). Teachers and administrators found these data reports useful. Teachers found the reports clear and comprehensible and claimed to use the reports to plan instruction and allocate their time. Administrators used the reports to make building level decisions, allocate resources, and inform professional development. However, Brunner et al. (2005) noted that one of the limitations of this type of data system is that it only disseminates information based on a single standardized test.

Other types of data systems noted in the literature include systems based on

curricular need. Ysseldyke, Spicuzza, Kosciolek, Teelucksingh, Boys, & Lemkuil (2003) examined the effect of a computerized curriculum-based instructional management system designed to support math instruction in elementary schools. The data system is designed to match student skill level with level of instruction, provide increased practice time in essential areas, and provide feedback to students and teachers in a timely manner. Ysseldyke et al. (2003) found that there were positive outcomes for students in classrooms which used this particular instructional data system. Ysseldyke et al. (2003) reported that student math performance was higher compared to both within-school and a random sample of district students and that these gains were significant for high, middle, and low performing students. These findings highlight the benefits of data systems that provide information based on specific content and curricular needs as well as information that is timely, such that teachers could make immediate instructional decisions for both individual students as well as for the whole class.

In sum, what needs to be collected and what needs to be reported is important in assisting educators' experience with data-driven decision making. District support in organizing, collecting, and disseminating the appropriate type of data relieves schools from the additional time it would take to do these tasks as well as provide essential information to make decisions at the appropriate levels.

Context

Data-driven decision making is also influenced by contextual factors. Data use is a complex process that can be shaped by various organizational and institutional factors (Honig & Coburn, 2008). For instance, features of the evidence itself, individual and collective working knowledge of data, district or school organization, institutional norms,

and political dynamics may all influence educators' in their interpretation of data, their decision-making, and their resulting actions (Honig & Coburn, 2008).

Several research studies show how context, specifically in high performing versus low performing schools, affect how educators engage in data-driven decision making practices. Sanders (2009) found that different types of schools in different contexts use data differently. In a comparative case study of nine schools, Sanders (2009) found that high poverty schools with both high and low performance levels used data to target specific groups of students and curricular areas. By contrast, in low poverty schools with both high and low performance levels, data were used to examine all students in all subject areas (Sanders, 2009). High poverty schools used data to try to raise state achievement scores by targeting students who would give them the greatest advance in achievement scores. For instance, if students were scoring at a "basic level" on achievement tests, the school was more likely to spend time on interventions for these students because their move to the next level of "proficiency" would give the school the greatest overall gain. However, this targeted data-driven decision leaves students in other achievement levels with fewer resources (Sanders, 2009). In addition, high poverty schools often had more significant subgroups at their school site and spent more time on interventions targeted on the performance of these subgroups. In low poverty schools, these subgroups were not significant in number and therefore were not an area of focus (Sanders, 2009). Low poverty schools used data to make decisions for all students compared to individual groups of students at high poverty schools (Sanders, 2009). Sanders' (2009) findings are significant in pointing to the differences in how educators engage in data-driven decision making, leading to different outcomes for different groups

of students.

Similarly, Williams (2011) also found that there were differences in how principals in high and low performing schools used data, specifically in enhancing student achievement in mathematics. Williams (2011) found that although principals from both types of schools used a variety of data, data tools, and data systems to make decisions, there were significant differences between them. Overall, principals in lower performing schools used data to a greater extent than principals in higher performing schools. Williams (2011) suggested that a possible reason for the increased use of data stems from accountability pressures and principals in these schools may spend more time searching for solutions that would emerge from the data. Principals from higher performing schools not only used data to a lesser extent, but also found that process type of data was more effective than outcomes type of data. Principals from higher performing schools compared to principals from lower performing schools reported that data from benchmark assessments and standardized tests were most used and more effective.

Both studies illustrate how educators' engagement in data-driven practices differs depending on their contexts. Accountability pressures and needs of students and school community are only a few contextual factors that influence the type of data that educators perceive as useful and how they decide to take action.

Summary of the Factors

Based on the literature, several key factors influence data-driven decision making at the district, school, and classroom levels. These factors include the importance of establishing a culture around data use, having systems in place, providing the appropriate

supports and resources, collection and dissemination of data, and the district and school contexts. All of these factors play a role in how educators make meaning of data and how they take action accordingly.

School Leadership and Organizations

Learning Organizations

Data-driven decision making may also be influenced by how schools are organized around learning. The way a school is structured, the routines that are established, the type of learning opportunities available, and how individuals within a school interact with each other determine how a school is focused on continuous learning and improvement. For instance, Spillane (2012) posited that organizational routines affect how staff members interact and how data are used, interpreted, and acted upon. Spillane (2012) stressed the importance of studying data-driven decision making in terms of data practice and how practice is determined by how educators go about their daily work and interact with each other. Social and organizational structures establish a school's organizational routines and these routines determine the norms, rules, and resources for how staff members will ultimately act on data (Spillane, 2012).

Darling-Hammond (1994) described learning organizations in her discussion of authentic assessments. Darling-Hammond (1994) stated:

> In order for assessment to support student learning, it must include teachers at all stages of the process and be embedded in curriculum and teaching activities. It must be aimed primarily at supporting more informed and student-centered teaching rather than at sorting students and sanctioning schools...In order for schooling to improve, assessment must also be an integral part of ongoing teacher dialogue and school development...When supported by adequate resource and learning opportunities, authentic assessment increases the capacity of schools to engage in recursive process of self-reflection, self-critique, self-correction, and self-renewal. As schools thus become learning organizations, they can increase their capacity to ensure that all of their students learn. (p. 25-26)

A key point to emphasize in Darling-Hammond's (1994) statement is that schools become learning organizations when they create opportunities to learn from assessments, and thus the resulting data from these assessments are used as a vehicle for having authentic discussions centered on student learning.

Principal Leadership

Establishing learning organizations is often a direct result of the decisions and actions of the school leader or principal. In fact, many research studies have been conducted highlighting the importance of principal leadership in creating learning organizations as well as supporting data-driven decision making practices. For instance, Timperley (2011) examined five elementary school principals whose student achievement gains were three times the expected rate of progress. Timperley (2011) found that principals at these schools acted as a source of knowledge for teaching and learning. The principals formed trusting relationships with staff and had high expectations for them in terms of teaching and learning. Principals provided professional learning opportunities and assisted teachers with translating knowledge into practice. The significance of this study is that these principals knew how to be leaders of learning, not just promoters of learning. The learning that took place was influenced by the full engagement of the school leader in classroom practices.

In a different study, Timperley (2005) described how the school leader created a context for learning centered on data-driven decision making. The school leader, in this case an assistant principal, alongside a consultant in an action research project, provided opportunities for teachers to learn how to use data to improve instruction within the context of school. This particular study outlined the leader's process of changing

teachers' existing beliefs about teaching and learning, specifically around teacher efficacy and student performance, and developing the skills needed to analyze and interpret data that would ultimately lead to changes in teacher practice. The leader's goal of using data as a catalyst for professional learning was successful, but took a great deal of strategic thinking and work. Timperley (2005) described the task in the following way:

> Creating a professional learning context within the school that simultaneously addresses the knowledge, skills, and expectations is a demanding task for the most competent and experienced leader. In this case, it took the combined expertise of the leaders' knowledge of the context and the open relationships she had with her teachers, the author's more specialized knowledge about using data to challenge teachers' beliefs and practices, and the continuing feedback from teacher interviews to inform the process. (p. 19)

Timperley's (2005) study is significant in that it highlights the school leader's challenge of incorporating data-driven decision making practices into the daily work of teachers. It involves providing the right opportunities within the context of the workplace to challenge existing beliefs, developing skills to analyze and interpret data, and opportunities to change teaching practice based on data that would result in improved student performance.

Similarly, in a qualitative case study conducted in a Connecticut middle school, Cimma (2010) found that the principal was responsible for setting the tone for data-driven decision making to take place. The principal did this by allocating resources in terms of professional development and time spent during scheduled meetings toward data-driven decision making and instructional practice. The principal also offered personal support to teachers with data-driven decision making practices, demonstrating to teachers that data use was a priority at the school (Cimma, 2010).

Thus far, the school leader or principal has been described as a key factor in data-driven decision making in terms of providing professional learning opportunities, supporting teachers with practice, and creating the appropriate structures that support data use at school sites. However, the literature highlights another aspect of the principal role in data-driven decision making, focusing on the principal or school leader's relationship with the school district or management organization in the case of charter schools. For instance, in a case study of four urban school systems, Wohlstetter, Datnow, & Park (2008) found that school leaders needed a certain amount of autonomy to make decisions that would encourage and foster data-driven practices. These decisions included where to allocate resources, whether to keep certain types of instructional programs, and hiring and firing of staff members. Wohlstetter et al. (2008) explain:

> Several educators pointed out that allowing flexibility to use different instructional strategies was a necessary component in fostering data use. Decisions needed to be seen as arising from data rather than simply from system mandates. Thus, there were a variety of ways in which classrooms were organized, how students were grouped, and types of programs within the district and CMO [charter management organization]. (p. 252)

Furthermore, Levin & Datnow (2012) described the principal as the mediator between districts and schools and that the interactions of the principal with teachers as well as the district influences how data-driven decision making will be taken up at school sites. Principals are described as mediators in a multi-level power organization and must act on what is being asked of them through policy and politics as well as take actions that meet the needs of teachers and students in the context of their own schools. Levin & Datnow (2012) described four key actions by principals that facilitate data-driven decision making. These actions include formulating goals that are specific to the needs of the school, providing structures to support data-driven decision making, building

human and social capital, and creating a climate of trust and collaboration. Along the same lines, Halverson, Grigg, Prichett, & Thomas (2005) described how principals must respond to external accountability factors and react intentionally about how to use data within their schools that meet new accountability demands. Halverson et al. (2005) explained this by describing the school leader's role in the following way:

> While teachers are ultimately responsible for improving student learning in schools, changing the organizational conditions for improvement across schools is the central task of school leaders...all schools already engage in many forms of data-driven decision making that rely on quantitative data on student attendance, grading, budgets and student placement and on qualitative data on teacher, student, and parent reputations...The press for data-driven decision making, then, is not a call for schools to begin to use data, but a challenge for leaders to reshape the central practices and cultures of their schools to react intentionally to the new kinds of data provided by external accountability systems. (p. 3-4)

States and districts may set policy and expectations for data-driven work, but the interpretation of such policies and strategic implementation by the school leader is what will determine how data-driven decision making is taken up by individuals at the school site.

Distributed Leadership

Although principal leadership is a critical component to data-driven decision making, there is a body of literature that discusses the importance of distributed leadership as well. When considering implementation of data-driven decision making and other kinds of educational reform, Fullan (1994) claimed that neither top-down nor bottom-up strategies for educational reform work, and that what is required is a blend of the two. In a distributed leadership perspective, school leadership is not just about the actions of a particular individual. Rather, it is a distributed practice by multiple individuals and is based on a school's social and situational context (Spillane, Diamond,

& Jita, 2003). From this perspective, school change does not happen unless multiple individuals are on board, working in tandem. The distributed perspective is about mobilizing and guiding entire school staff and involves both formal and informal leaders. Spillane, Diamond, & Jita (2003) explained:

> This distributed perspective is also essential as a practical matter because educational leaders who cannot engage others in leading will not be very successful. They will not be able to spread and mobilize the expertise necessary for instructional improvement in their organizations, and thus, are unlikely to be very effective...To improve educational leadership, therefore, it is essential to understand how the practice of leadership is stretched over the work of multiple leaders in an organization. (p. 542)

In addition, distributed leadership is not about describing leadership traits. Instead, distributed leadership is about practice- practice is about the interactions of people and what they do together in a particular context. Spillane & Orlina (2005) described the term practice in the following way:

> Practice is used to refer to the comprehensive enactment of the profession, a set of specific skills or behaviors...and the actual doing of leadership in particular places and times...knowing what leaders do is one thing, but a rich understanding of how, why, and when they do it is essential if research is to make a meaningful contribution to understanding and improving leadership practice. (p. 161)

In a study of four urban school districts, Park & Datnow (2009) looked at how a data-driven culture was cultivated from a distributed leadership perspective. They found that leaders at all levels of the education system had co-constructed a school environment focused on data-driven practices and based on learning and continuous improvement. The data-driven culture fostered trust between educators rather than an emphasis on blame and was created by how messages were conveyed throughout the district and school site. The norms emphasized that data were non-evaluative and a tool for continuous improvement. Principals presented themselves as instructional leaders and

supporters of teacher development. Data use was seen as a key improvement strategy and resources were allocated to improve the capacity of educators at all levels of the system. From a distributed leadership perspective, the data-driven culture was co-created between individuals at various levels and not solely on the actions of one leader. Park & Datnow (2009) described the success of these districts in the following way, "We find that leaders and leadership practices centre on creating and maintaining an ethos of continuous improvement, building capacity through modeling and learning, distributing decision-making practices, and distributing best practices through knowledge brokering" (p. 483).

Similarly, in a study of five urban high schools undergoing comprehensive schoolwide reform, Lachat & Smith (2005) found that in the two high schools in which data-driven decision making was most effective, the use of data was influenced by the leadership of the principal as well as other leaders in the school, such as the assistant principal, department chairs, literacy coaches, and teacher leaders. All of these individuals helped staff members throughout the school use multiple types of data by motivating teachers and providing follow-up assistance. Lachat & Smith (2005) explained, "Not all principals, even if they support data use, have all of the skills or time needed to move the process forward productively, especially in high school settings where the restructuring process is particularly complex and demanding" (p. 344).

Park & Datnow (2009) and Lachat & Smith (2005) both present case studies where distributed leadership played a critical role in the implementation and support of data-driven decision making practices. However, distributed leadership itself is not a cure-all approach to effective leadership and data-driven decision making

implementation. Harris, Leithwood, Day, Sammons, & Hopkins (2007) stated, "Distributed leadership is not necessarily a good or bad thing. It depends. Distributed leadership does not automatically result in organizational improvement. Much depends on the way in which leadership is distributed, how it is distributed and for what purpose" (p. 345). Thus, in the case of data-driven decision making, distributed leadership itself does not necessarily result in data-driven practices at school sites. Distributed leadership practices can, however, aid in fostering a culture of mutual trust and collaboration as well as utilize the expertise of staff members to help engage schools in routine data use.

Classroom Teachers and Data-Driven Decision Making

The following section focuses on literature that specifically examines classroom teachers' use of data. This section is divided into several parts. The first part gives an overview about what is generally known about teachers and their engagement in data-driven decision making. The second part discusses how the design of assessments influences teacher data use. The third part examines how teacher collaboration and interaction are key factors in teachers' ability to interpret and analyze data. The fourth part discusses reasons why teachers may *not* be using data. Finally, the last part centers on the importance of studying teacher practice.

What We Know About Teachers and Data-Driven Decision Making

Many studies have been conducted on districts and schools that have either been successful with the implementation of data-driven decision making practices or focus on data-driven decision making as a key factor in district or school-wide reform efforts. Most of the data collected from these studies have come from interviews, surveys, and qualitative classroom observations. Overall, these studies have found that teachers

believe that data are useful and help to inform their work (Marsh, Kerr, Ikemoto, Darilek, Suttorp, Zimmer, & Barney, 2005; Togneri & Anderson, 2003; Datnow et al., 2008; Supovitz & Klein, 2003). Teachers also use data in a variety of ways including monitoring progress, making instructional decisions, identifying areas of weakness in student performance, identifying struggling students, and creating interventions based on student needs. (Marsh et al, 2005; Wayman, Cho, Jimerson, & Spikes, 2012; Schildkamp & Kuiper, 2010). Supovitz & Klein (2003) summarized data use by administrators and teachers in the following seven ways: data are used to inform instruction, identify low-performing students, plan professional development, set targets and goals, celebrate accomplishments, reinforce priorities, and support conversations about student performance with parents.

Teachers also use many types of data (Togneri & Anderson; Datnow et al., 2008; Supovitz & Klein, 2003) including data from state assessments, district benchmarks, student portfolios, chapter tests, journals and other types of classroom assessments. The literature specifically highlights, however, that teachers prefer classroom type of assessments over formal assessments from the state or district (Schildkamp & Kuiper, 2010; Marsh et al, 2005; Supovitz & Klein, 2003). Teachers believe that classroom assessments tend to be more thorough and provide more timely information that would inform their instruction, while assessments coming from the state or district simply reinforce what they already know from classroom assessments (Marsh et al, 2005; Supovitz & Klein, 2003).

In addition, in districts or schools that focused on data-driven decision making, teachers generally received professional development to support them in data use (Marsh

et al., 2005; Togneri & Anderson, 2003; Datnow et al., 2008; Wayman, 2005). Particular areas of professional development still needed, however, is assisting teachers with the use of technology and data tools (Wayman, 2005) as well as helping teachers link data with teacher instructional practice (Coburn & Turner, 2012).

Design of Asssessments and Teacher Data Use

The *design of the assessment* itself may also have an impact on the way teachers are able to analyze and interpret data (Supovitz, 2012). In a discussion about formative assessments, Supovitz (2012) outlines three qualities about assessments that have potential value to teachers and their instructional practice. First, tests have the potential to convey information about students' development toward learning goals. Second, tests can provide information about students' thought processes. Third, tests can reveal students' misconceptions (Supovitz, 2012). These three qualities inform teachers about student thinking and, if assessments are timed appropriately, have the potential to guide teachers in their daily classroom practice. Chappuis & Chappuis (2008) also described how formative assessments are particularly beneficial to teachers because they provide information *during* the instructional process and that this process is ongoing and dynamic. Formative assessments are designed to be used throughout the learning process and to provide information that will guide both students and teachers in a learning process. Although Supovitz (2012) and Chappuis & Chappuis (2008) are specifically addressing the value of formative assessments, it is importance to consider the design of all assessments in terms of the information that will be reported and the purposes in which the data will be used. Thus, in considering other types of assessments that are given to students, including state tests and district benchmarks, the potential benefits for

teachers in using these data must be addressed in the design of the assessments themselves. If the expectation is for teachers to use data to make classroom decisions, then the assessments and the way data are reported must address teacher use.

Teacher Collaboration and Interaction

A body of research on teacher data-driven decision making focuses on teacher collaboration and interaction. These studies purport that the interpretation and use of data are co-constructed between people in their social interactions and conversations (Daly, 2012). Studies have highlighted different aspects of teacher collaboration and their impact on data-driven decision making practices. For instance, Young (2006) examined how agenda setting and norms of interaction between teachers influenced data-driven practices. In a case study of four schools from two different districts, Young (2006) followed grade-level teams of teachers and studied how they collaborated in team meetings. Young (2006) posited that agenda setting is a deliberate and strategic leadership action by both the district and school leader as they encourage and support teacher data use. The district sets agendas by determining curriculum and setting policies related to data and assessments, sending messages to the schools about district priorities around data. School leaders set agendas by mediating messages from the district and determining the work that will take place at teacher team meetings. As district and school leaders look to improve instructional practice through the use of data, agenda setting establishes the rationale for teachers' work and articulates the expectations for how data is to be used. Agenda setting also promotes data-driven rhetoric, sets the stage for teachers to engage with data, mediates teachers' use of data, and helps teachers plan and scaffold instruction during scheduled meetings (Young, 2006). Along with agenda

setting, Young (2006) discussed the importance of norms of interactions amongst teachers. Young (2006) posited that pre-existing norms of interaction, including levels of autonomy and willingness of teachers to learn from each other, shape the depth of teacher conversations and how they engage with data. Norms of interactions can facilitate or deter teachers' collaborative use of data (Young, 2006). Thus, both agenda setting and norms of interactions between teachers have the potential to facilitate data-driven practices.

Similarly, Datnow (2011) found that structured meetings centered on data were helpful for teachers in engaging in data-driven decision making. In a case study of urban schools from across the United States, Datnow (2011) examined teacher collaboration during structured meetings to determine if teachers were genuinely engaged in learning from data and from each other. Datnow (2011) was particularly interested in whether teachers were genuinely engaged in learning from each other, as opposed to contrived congeniality (Hargreaves, 1994), where teachers meet together, but their actions are based on compliance rather than real learning. In Datnow's (2011) study, the teachers met regularly throughout the school year during time set aside during the school day. The purpose of these meetings was to examine data and plan instruction collaboratively. The principals of these schools set expectations for the meetings, including norms of interaction such as how to behave during meetings and what materials to bring. Teachers were also expected to compile data binders and bring these with them to the meetings. Data discussion protocols were provided by the districts and used by the teachers. Datnow (2011) ultimately found that although district and school leadership set the tone and expectations for teachers' work, teachers genuinely collaborated around data. In both

studies, Young (2006) and Datnow (2011) described school settings where teacher collaboration was structured and scaffolded by district and school leadership. In both studies, data-driven decision making was a priority and teachers were expected to work together to make meaning from data to inform practice. The results were that teachers found the meetings useful for their practice.

Thus far, studies on teacher collaboration have highlighted structures such as scheduled meetings, agenda setting, and explicit norms of interactions. However, another body of literature focuses on how teachers *talk* with each other and how their conversations influence how they make sense of and act on data. For instance, Horn & Little (2009) studied teacher work-group interactions at two urban high schools. Specifically, Horn & Little (2009) examined how conversational routines enhanced or limited opportunities to learn within teacher professional communities. Horn & Little (2009) defined conversational routines as, "patterned and recurrent ways that conversations unfold within a social group" (p. 184). In this study, teacher work-group conversational routines differed in terms of how the teachers were able to learn from each other in problems related to their practice. Horn & Little (2009) explained, "Conversational routines provided different resources for them to access, conceptualize, and learn from problems of practice...the groups differed in the extent to which conversational routines supported the linking of frameworks for teaching to specific instances of practices" (p. 181). They continued to explain:

> We argue that this movement between the particular and the general provided the group an important opportunity to learn. Specifically, it was a means of developing teaching knowledge that is deeply rooted in embodied accounts of classroom life, joining important concepts about teaching to particulars of practice. In this way, we see the conversational moves identified here as critical to the development of this knowledge. (Horn & Little, 2009, p. 197).

Horn & Little's (2009) description of how this particular teacher work-group moved back and forth between general teaching practice and particular classroom instances is an example of ways that teachers are trying to make sense of their work together. Along the same lines, Coburn (2001) talked about how sensemaking happens when teachers have conversations with each other. Coburn (2001) explained,

> I then argue that collective sensemaking- and ultimately, the influence of messages from the environment on classroom practice- is shaped by two factors: (1) the patterns of interaction among teachers, specifically who is talking with whom in what setting, and (2) the character of conversation, specifically the extents to which conversations are structured to provide conditions for engagement and reflection. (p. 151-152)

Conversational routines (Horn & Little, 2009) and collective sensemaking (Coburn, 2001) are significant when considering data-driven decision making practices amongst teachers. When teachers are collaborating with each other, opportunities to learn will either be enhanced or inhibited, depending on how teachers interact and talk with each other. Taken together with agenda setting and norms of interaction, teacher collaboration is an important factor in how teachers will engage in data-driven practices.

Not All Teachers Engage in Data-Driven Practices

Although many studies have been conducted emphasizing districts and schools that are successfully implementing data-driven decision making practices, not all studies indicate that this is the case. In a case study of nine districts and eighteen schools, Means, Padilla, DeBarger, & Bakia (2009) found that although teachers were receiving professional development at both district and school levels around data use, data from data systems had little effect on teachers' daily instructional decisions. They found that neither the type of assessment nor the time frame in which teachers received data helped them to make daily instructional classroom decisions. Part of the problem was that

teachers felt that they were unable to use the data systems to retrieve the information that they needed for instructional purposes, either because the data systems were too hard to use or because they could not navigate the system in such a way to find what they were looking for. Teachers also reported that they lacked time and training to engage in data inquiry (Means et al., 2009).

In a separate study, Dunn, Airola, Lo, & Garrison (2013) investigated the variables that facilitate teacher adoption of data-driven decision making practices. Their findings revealed that a large number of teachers perceived their ability to analyze and interpret data was different from their ability to connect their interpretations to instructional decision making (Dunn et al., 2013). Dunn et al. (2013) reported:

> The authors hypothesize that emphasis needs to be added to understanding the basic skills required to evaluate data and interpret data-based findings, and that while these skills support application of data to classroom practice, teachers clearly believe that the skills to understand data are significantly different from the skills they need to apply data to classroom decision-making. (p. 95)

These findings are significant when considering the types of professional development and support that teachers may need in order to engage in data-driven decision making that would have positive outcomes on student performance. The assumption is that if teachers are able to analyze and interpret data, then they will know what to do in the classroom in terms of adjusting instruction. Clearly, the findings from this study show that teachers see this as two different capacities. Thus, teachers may know what the data mean, but not know what to do with the data.

Another issue that may foster or hinder teacher data use is around the notions of power and authority. Stephens, Pearson, Gilrane, Roe, Stallman, Shelton, Weinzierl, Rodriguez, & Commeyras (1995) examined the power structure between assessment,

instruction, and decision-making in four districts in Illinois. Teachers in two out of the four districts were given greater autonomy and authority and had more decision-making capability. Teachers in the other two districts had little decision-making authority and covered the curriculum that was mandated by the districts. The findings from this study indicated that only assessments as tests drove instruction and only in schools where teachers had little curricular authority. In addition, in schools where teachers had little authority, more value was placed on standardized tests than in schools where teachers had greater authority (Stephens et al., 1995). Thus, issues of power, authority, and autonomy seem to play a role in how classroom teachers respond and take up data-driven practices as well as if data influences their instructional practice.

The Practice of Data Use

Several scholarly articles have been written emphasizing the need to study data-driven decision making in terms of teacher practice. For instance, Cuozzo (2010) stated:

> Often lost amidst these big picture efforts are a focus on the most micro- (and arguably the most important) level of accountability mechanisms embedded in the day-to-day teaching learning process. After all the speeches are made, policies set, laws enacted, curriculum approved and standardized tests designed, it is ultimately what happens with us and our students, in our classrooms, that makes the biggest difference. (p. 6)

Cuozzo (2010) emphasized the need to focus on instructional practices and described basic pedagogical principles that are essential to data-driven decision making. These essential principles include having clear performance objectives for students as a result of daily instruction, providing explicit instruction, developing and using formative and summative assessment tools, and using data to provide supplementary instruction to students who need it or re-teaching content in a new way (Cuozzo, 2010).

Coburn & Turner (2012) also believed that research needs to be conducted around teacher practice. Coburn & Turner (2012) stated:

> Investigating the practice of data use directly is important if we are to understand what is happening at the ground level of one of the most prominent strategies for educational improvement in the country. Understanding the practice of data use not only can help us explain the outcomes of data use but also provides insight into when and under what conditions data use acts as a productive pathway to educational improvement and when it does not. (p. 100)

Little (2012) argued that there needs to be better research regarding data-driven decision making and teacher practice in terms of micro-process studies. Little (2012) explained:

> Methodologically, a micro-process orientation requires close attention to patters of on-the-ground interaction. Although interviews, surveys, and self-report logs and diaries supply ex situ accounts of practice and point usefully to salient dimensions of interaction and context, it seems unlikely that a robust understanding of practice can be achieved absent the strategic use of methods that capture the detail, nuance, and patterning of social interaction. (p. 146)

All of these authors together are essentially arguing that data-driven decision making and teacher practice need to be studied in-the-moment, in real-time, with observations that capture the interactions and meaning making that occurs as teachers engage with data. However, Cuozzo's (2010) focus on classroom pedagogy is important, especially when research findings indicate that the capacity to analyze and interpret data are different from the capacity to link data to instructional practice (Dunn et al., 2013). For instance, studying teacher collaboration and meaning making during grade-level meetings does not necessarily mean that interpretations made during these meetings translate into effective instructional practice in the classroom. Thus, a focus on teacher practice in relation to data-driven decision making is still an area of need.

Summary of Section

Studies have illustrated that many teachers are doing quite a bit of work around data-driven decision making, especially in collaboration with other teachers. However, teachers' use of data is influenced by many factors including how the assessments are designed, how teachers interact and talk with each other, and the kinds of supports they may or may not be receiving from their district or school. The literature also indicates that more research in the area of teacher practice around data-driven decision making is needed.

Problems and Challenges

The last part of this literature review describes the problems and challenges that exist around data-driven decision making. Although there are many problems and challenges related to data-driven decision making, the types of problems can be categorized into seven different areas. This section will describe these problems and challenges according to the following areas: problems with data access and time, data misalignment and multiple initiatives, teacher capacity and efficacy, overly complicated data systems, politics and policies, issues concerning authentic learning, and the problem of having too much data.

Access and Time

Perhaps the most commonly reported challenge with data-driven decision making discussed in the literature is the issue of data access and time (Lachat & Smith, 2005; Ingram, Louis, & Schroeder, 2004; Dembosky, Pane, Barney & Christina, 2005; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). For instance, in their study of five urban high schools undergoing comprehensive school-wide reform, Lachat & Smith (2005)

found that all five high schools had problems with accessing accurate and timely data from district information systems. One of the reasons why this was a problem was that the infrastructure for data use did not support what the schools needed. For instance, district personnel were overburdened with multiple data requests concerning multiple projects and could not fulfill requests in a timely manner. Also, data personnel did not know how certain data were to be used, making it difficult to report data in a way that could assist educators in their work. Lachat & Smith (2005) explained that the schools did not realize the extent to which data in their data systems were not complete or accurate until they began to engage with data more frequently. Similarly, in their study of nine high schools known for their work around continuous improvement, Ingram et al. (2004) found that teachers did not have enough time to collect and analyze data to make decisions. The teachers in their study thought that data collection would take time away from their instruction. The teachers did not see data-driven decision making practices as a priority and the schools did not necessarily carve out time for teacher to do this work. Dembosky et al. (2005) also found that the biggest challenge to schools and districts in Southwestern Pennsylvania around data-driven decision making was finding enough time to study the data that were made available to them. Educators lacked time to collaborate and interact with others as well as plan interventions for students (Dembosky et al., 2005). These three research studies are just some of the many examples in the literature that report access and time as a challenges for educators when it comes to data-driven decision making.

Misalignment and Multiple Initiatives

Several studies indicate that educators perceive data-driven decision making as challenging because of a misalignment between data use and other instructional initiatives. In a study of three urban school districts that promoted data use for instructional improvement, Kerr et al. (2006) found that in two of the three districts, data use was misaligned with curricular reforms. These two districts emphasized curriculum that standardized both the content and timing of instruction across and within schools. However, the districts also emphasized the importance of using data to determine areas of need for students and to use data to re-teach or reinforce particular concepts called out in the data. Some teachers did not feel that they could address the needs of the students called out by the data and still follow the curriculum guidelines and pacing, especially since districts and schools held teachers accountable for curriculum pacing by mechanisms like classroom visits. Kerr et al., (2006) summarized this issue in the following statement:

> In short, from the perspectives of some teachers, using data to guide instruction conflicted with other district instructional efforts. Districts seeking to promote greater data use by teachers might consider the nature of other instructional reforms, particularly those involving curriculum coverage and pacing, to ensure flexibility to alter instruction based on data analysis. (p. 516)

Hubbard, Datnow, & Pruyn (2013) also found that educators' use of data was hindered by the implementation of multiple initiatives. In a year-long case study of an elementary school, Hubbard et al. (2013) found that data-driven decision making practices were inhibited by tensions created by requirements to implement multiple reform initiatives. The educators in this school were required to implement Project Based Learning (PBL) as well as adopt the International Baccalaureate (IB) Program, while also

emphasizing the regular use of data to inform instructional practices. In addition, the school was also preparing to shift to the federal government's Common Core Standards. All of these initiatives individually were demanding on teachers and together, created tensions about what to teach and how to teach it. Hubbard et al. (2013) described the tension created from these multiple initiatives in the following way:

> Along with this focus on data use and basic skill development, Orchid Heights' adoption of the IB program required that teachers successfully implement a total of six IB Units of curriculum in a one-year period and to continue to do so on an annual basis in order to maintain certification. The IB program stipulated that there was to be little, if any, overlap between the units and teachers had to conduct ongoing planning and assessment of the units. The IB Certification process was rigorous and placed significant demands on teachers...With the adoption of Problem Based Learning, teachers needed to learn rather quickly about this new student centered approach to learning and how to implement PBL units in their classroom for the first time. (p. 9)

Teachers at the school site perceived that these initiatives were incompatible, which in turn, hindered effective data-driven decision making practices. Hubbard et al., (2013) also found that teachers' compartmentalized information gathered from data and primarily used data to address language arts and mathematics, but did not translate this knowledge to science or social studies. Thus, data about student learning were not integrated into instructional practices throughout the school day.

Teacher Capacity and Efficacy

Another challenge concerning data-driven decision making is around teacher capacity and efficacy. Teachers may lack the capacity to engage in data-driven practices and/or districts may lack the resources to support and build teacher capacity. For instance, Kerr et al. (2006) found that both of these issues were the case in their study of data-driven decision making. Swan & Mazur (2011) also found that teachers varied in their capacity to use data. In a study of pre-service teachers' use of a web-based tool

designed to collect and display student level data, Swan & Mazur (2011) found that although teachers were able to access student level data in a timely manner, teachers varied in their analysis skills as well as their ability to act on their interpretation of data. Swan & Mazur (2011) stated, "Convincing teachers to make data-driven decisions and giving them tools to help them may be necessary, but it is not sufficient to ensure that they make appropriate data-driven decisions. The evidence presented is still filtered through the teacher" (p. 217).

In addition to teacher capacity, Ingram, Louis, & Schroeder (2004) found that teacher efficacy was a challenge to successful teacher engagement in data-driven decision making. They found that some teachers believed that it was their job to deliver the curriculum, but that learning was the responsibility of the students. Ingram et al. (2004) stated, "The notion that teachers should collectively, take responsibility for student outcomes is both recent and controversial" (p. 1278). Data-driven decision making is based on the premise that data will inform practice and ultimately impact student performance. If teachers do not believe that their instructional actions make a difference in student performance, then data-driven practices will not be priority.

Data Use is Overly Complicated and Burdensome

Several articles have been written arguing that data-driven decision making has been more of a burden than an asset (Doyle, 2003; Schmoker, 2003; Wayman, Cho, Jimerson, & Spikes, 2012). Although much of the literature presented highlight districts and schools that have found successes with data-driven practices, many districts and schools still struggle with data use. Doyle (2003) thought that most schools have not been successful with data-driven decision making because collecting and analyzing data

have been too complicated. Doyle (2003) offered three suggestions to remedy this challenge. First, there must be a way use data warehousing tools to assist educators and support their decision making. These tools must be easily accessible. Second, there must be curricular alignment so that educators know what to teach and that allows them to measure what students are learning. Third, Doyle (2003) emphasized the importance of community engagement and making data accessible to parents and the community.

Similarly, Schmoker (2003) argued that data-driven decision making has been made out to be too complicated. Schmoker (2003) proposed that data-driven decision making can be simplified by addressing two questions. First, which data do teachers use? Second, does using this data help to improve teaching and learning? Schmoker (2003) believed that data-driven decision making should start by considering the needs of teachers. Ultimately, Schmoker (2003) thought that the problem has been that teachers do not know their goals and do not know their data in relationship to those goals.

Wayman et al. (2012) conducted a study in three school districts specifically looking at educators' attitudes toward data. They found that there were many barriers to data use that resulted in negative effects on attitudes toward data. These barriers included technical problems with data systems and the labor-intensiveness of using data. Wayman et al., (2012) found that these barriers inhibited data-driven practices.

Politics and Policies

One of the main challenges in data use is that that school leaders may feel tension around the accountability and improvement imperatives at both the state and local level (Earl & Fullan, 2003). Earl & Fullan (2003) examined this tension by studying three different accountability contexts and the way that school leaders responded to data-driven

decision making in each one of these contexts. The three contexts included a national reform movement in England, a non-profit and non-government school improvement initiative in Canada, and a major school reform education bill in Ontario, Canada. All of these different contexts had extensive data systems in place. Earl & Fullan (2003) found that all school leaders had reservations about their hopes for data use in school planning and expressed concerns about understanding the data. In two out of the three contexts, school leaders were concerned with power struggles associated with data collection and were worried about the consequences associated with making data public. Leaders were concerned about how to address the public on data that showed that schools needed improvement. While all groups expressed positive feelings about how data had provided insights into their decision making, school leaders were concerned about translating data into useable knowledge and how to communicate data with their constituents (Earl & Fullan, 2003). The findings from this study point to the tensions that school leaders may feel about data use as well as the difference between using data for improvement and using data for surveillance (Earl & Fullan, 2003). In order for data-driven decision making to take hold and improve student achievement, Earl & Fullan (2003) stated the following criteria must be met:

> A move from accountability as surveillance to accountability for improvement requires a fundamental mind shift. But, as long as the focus is on compliance with surveillance demands, the actions are fragile and can use valuable energy without making a difference. Educators, themselves, ought to be the prime consumers of data in the process of making decisions based on intrinsic reasons for collecting and using data, regardless of the external requirements of reinforcement. To do this, they must become experts in interpreting data and transforming it into knowledge. (p. 393)

Not only do politics and policies create tensions with school leaders, tensions around data use may also exist among teachers. Ingram et al. (2004) reported in their

research findings that teachers described situations where they felt data were misused to force a decision that was already made rather than to genuinely inform decisions. Ingram et al. (2004) explained that teachers had a mistrust of data, which could result in adverse reactions toward collecting and using data themselves. These findings have implications for how messages about data-driven decision making are conveyed and communicated by district and school leaders.

Finally, there are concerns about how politics, policies, and accountability systems may cause schools to focus on shaping their curriculum and instruction to improve test scores (Lipsitz, 1997). Lipsitz (1997) explained, "Schools and school systems have become obsessed with 'looking good' on the state tests, rather than with diagnosing and increasing students' knowledge and skills" (p. 533-540).

Authentic Learning

Schmoker (2009) claimed that educators are too focused on test scores rather than on authentic learning. Schmoker (2009) described authentic learning as learning centered on critical thinking, problem solving, analyzing arguments, conducting research and inventing or synthesizing information. Schmoker (2009) described this problem in the following way:

> In the last few years, at the invitation of school administrators, I have observed in several schools with good reputation. I found that in most classrooms, ill-devised lessons, aimless group activities, and busywork predominated. Worksheets were everywhere, and movies blared through school hallways. There was almost no emphasis on critical thinking, problem solving, reading, discussion, or writing. Ironically, faculties showed little interest in improving instruction because each of these schools enjoyed exceptional test scores, and some had received their respective state's highest rating for academic achievement. That data itself created a ceiling on instructional improvement. (p. 72)

Schmoker (2009) brought up a salient problem in that educators do not think they need to improve if their data tell them that students are doing okay. Yet, there is certain injustice to the kind of education that students in these schools receive. Students may be successful, but they are successful on their own, in spite of the education they are receiving.

Similarly, Datnow et al. (2008) found that teachers were concerned about an over-reliance on test scores. Teachers felt that there was a narrowing of curriculum and what was addressed on assessments influenced what was taught in the classroom. Teachers also felt that data-driven decision making resulted in targeting of specific students for instruction and that other students were not getting similar attention (Datnow et al., 2008). On the other hand, Wayman et al. (2012) found that some educators thought that content in state tests were irrelevant to their work and thus, data from these assessments were not useful for them.

Still, other research has shown that assessments and data can inform teachers about areas of weakness in student performance, but not necessarily cause teachers to change the way in which they teach (Firestone, Mayrowetz, & Fairman, 1998). Interestingly, they found that data use often resulted in some type of action by teachers, such as putting up word walls or re-teaching a concept. However, instructional methods for teaching did not change greatly (Firestone et al., 1998). Thus, the problem is that data can inform instruction, but this instruction may just be more of the same thing.

Too Much Data

Finally, a challenge for many educators around data-driven decision making is that there is simply too much data. There are many challenges involving too much data.

First, not all data are worth using (Popham, 2008). Popham (2008) described how teachers receive a "hodgepodge" of student performance data on "fundamentally dissimilar sorts of skills and knowledge" (p. 85). Popham (2008) argued that although teachers are encouraged to analyze and use data, it is difficult to act on the data that they receive. Roderick (2012) described the rapid changes in data tools and the inundation of data facing educators and states, "Perhaps as a result...the problem with access to data has shifted from not having enough to having too much...are all of these data actually supporting instruction and school practice? And what are the conditions under which they do?" (p. 4). Roderick (2012) claimed that there is not enough good research to help educators know how to respond to data once they get it, such as appropriate teaching strategies that would result in improved student achievement. Thus, in this section of the literature review alone, accessibility of data as well as having too much data seem to be a challenge for educators in engaging in data-driven decision making practices.

Summary of Section

Clearly, there is much work to do around teachers' engagement in data-driven decision making. This section summarized some of the major challenges and problems involved with data use including accessibility and time, misalignment and multiple initiatives, teacher capacity and efficacy, overly complicated systems, issues around authentic learning, and having too much data. If teachers are to be successful with using data to inform instruction, both researchers and educators alike need to pay attention to the challenges called out in the literature and hone in on the ways that teachers can navigate around these challenges and engage in authentic learning and teaching.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

The dissertation was a qualitative case study of teachers' use of data in two elementary schools in San Diego County. The research study was conducted between September 2012 and March 2013. Each school was treated as a case and the cases were compared and contrasted. A qualitative case study/cross case analysis design was used because of its appropriateness in exploring the purposes of this study. Specifically, case studies are particularly useful in determining the "how" and "why" questions highlighted in this study (Yin, 2003). According to Creswell (2007):

> Case study research is a qualitative approach in which the investigator explores a bounded system (a *case*) or multiple bounded systems (*cases*) over time, through detailed, in-depth data collection involving multiple sources of information (e.g. observations, interviews, audiovisual materials, and documents and reports), and reports a case *description* and case-based themes. (p. 73)

Using case study methodology, the everyday practices of teachers in their workplace were investigated. Teachers' perspectives and experiences were recorded and documents were collected that illustrated teachers' engagement in data-driven practices. Although case studies cannot be generalized to other situations because of the unique contexts of each case, they are valuable sources of information for educators and educational researchers. Moss (2012) stated:

> When we learn from cases, we learn to ask better questions of the next case. Although the learning occurs on different timescales, this approach to theorizing is as relevant to researchers as it is to education professionals who must use data of various sorts to decide what to do next in their own contexts of work. (p. 230)

In addition to case study, a constructivist grounded theory approach was used to help make meaning of the findings as they emerged throughout the course of the study. Charmaz (2006) described grounded theory as the following:

> Grounded theory methods consist of systemic, yet flexible guidelines for collecting and analyzing qualitative data to construct theories grounded in the data themselves...data form the foundation of our theory and our analysis of these data generates the concepts we construct. (p. 2)

Throughout the seven months of data collection, data were continuously collected and analyzed, with patterns and themes emerging throughout this process to produce the ultimate findings.

Site and Participant Selection Procedures

Two different elementary schools in San Diego County were used in this study. San Diego County is an extremely diverse area in California with a number of different challenges, including large populations of English-language learners, students coming from diverse backgrounds, and students from both upper and lower socioeconomic status. Both schools chosen for this study were from the same school district, which meant the kinds of supports and overall district accountability context was held constant. However, each school represented different student populations including socioeconomic status, number of English-language learners, and overall student demographics. A specific strength of the selection of these particular schools was that the schools not only belonged to the same school district, but they were also located in the same geographical area and were under the same area superintendent leadership. This meant that the principal and teachers at both school sites received the same types of support, heard the same district messages, and received the same professional development opportunities. The fact that these factors were held constant had implications when accounting for the differences in the way teachers took up data-driven practices across schools.

Securing the district and schools to participate in this research study was particularly difficult. Initially, San Diego County was not the first choice for this

research study because of its physical location in relationship to the researcher. The districts and principals that were solicited outside of San Diego County would not allow outsiders access to their schools. After nine months of recruitment efforts, a San Diego County school district was contacted as well as several principals that worked in this district. Following district procedures and guidelines, a research proposal was prepared for the district's approval. The school district also required a short presentation of the research study to be presented to a district committee as well as permission and sponsorship from the area superintendent to which these schools belonged. After the proposal and research presentations were approved by both district committee and area superintendent, a memorandum of agreement was signed to ensure the researcher would abide by all district policies. After all district procedures were followed, a short summary of the research study was sent to both principals who recruited teachers for the study. The principals indicated that the teachers who agreed to participate in the research study were volunteers and were willing to open their classrooms and participate in interviews.

The participants in this study included the principal and three teachers from each school site as well as the area superintendent. The teachers represented different grade levels as well as different years of teaching experience. The diversity of the teacher participants was beneficial because it allowed for maximum teacher variation and provided a more authentic picture of various teachers' experiences with data-driven practices. However, the grade levels and experiences of the teachers were purely coincidental. The only basis for their selection was their willingness to volunteer for the study. However, the fact that the participants were volunteers is a limitation for this research study. Teachers who volunteer may be more likely to use data, may be more

savvy users of data, or may have positive feelings about their engagement in data-driven practices. The fact that they were willing to volunteer separates them from teachers who did not volunteer to participate in the study. In addition, it is also important to emphasize that the teachers from both school sites were elementary school teachers and elementary principals. Thus, the research findings are also limited to teachers at the elementary grades. The emphasis in this research study, therefore, was to look deeply at the way these *particular elementary school teachers* who *volunteered* for this study engaged in data-driven decision making practices and the findings for this study only represent these select group of teachers and their experiences.

All data were collected from September 2012 through March 2013. This allowed for approximately seven months to conduct interviews, schedule monthly classroom observations, and collect documents that would provide information on teachers' data-driven decision making processes.

Data Collection

Data for this study were collected through qualitative interviews, participant observation in the classroom, and document analysis. Each of these components will be discussed in greater detail in the following sections.

Interviews

Principals and teachers were each interviewed at the beginning of the study. The interviews lasted no longer than 60 minutes and were conducted at the school sites. Interview protocol guides were developed (see Appendices A & B) prior to the interviews and the questions were designed to generate information that would be useful

in answering the research questions. The protocol guides were also used to ensure the same basic lines of inquiry for each teacher and principal.

In addition to the principal and teacher interviews, the area superintendent was interviewed in February 2013. The purpose of this interview was to gain a better understanding of the overall district context, district priorities, and area focus. The interview also provided information about the district's focus on data-driven practices.

At the end of the study, final interviews were conducted with principals and teachers. Again, interview protocol guides were used to guide the discussion (see Appendices C & D). The purpose of these final interviews was to clarify additional questions from the researcher and provide opportunities for the participants to share any additional insights they had on the topic of data-driven decision making. These final interviews were brief, informal, and were an additional opportunity for participants to share their thinking around data use. However, several teachers were ill or absent for one reason or another on the scheduled dates for the interviews. These absences were unplanned and unpreventable. Thus, final interviews were conducted with both principals and only two of the teacher participants. Teachers who were unable to participate in the final interviews were provided with several open-ended questions taken directly from the interview protocol guide (see Appendix E). Three out of the four remaining teachers completed and responded to the open-ended questions. The one teacher that did not complete the open-ended questions had a serious medical condition at the time that prevented her from working and from responding to the questions. Although the use of open-ended questions was not ideal, the responses from the teachers that answered the questions were useful in clarifying and shaping the ultimate findings of

the research study. Additionally, these final interviews were used for clarification purposes along with data collected over many months in these teachers' classrooms through observations, document collection, and regular interaction with this select group of teachers. Although final interviews did not take place with all participants, the final interviews were only a piece of the data used to construct the ultimate findings.

Overall, a total of 13 interviews were conducted over the course of the research study. All interviews were recorded and transcribed.

Classroom Observations

Classroom observations took place between September 2012 and March 2013. Dates and times for the classroom observations were agreed upon by the principals, teachers, and researchers at least a month in advance of each visit. During each visit, classroom observation protocol guides (see Appendix F) were used that helped focus observations on the research questions. Because classroom observations took place after initial interviews with the participants, special attention was placed on the types of data that teachers and principals identified in their interviews.

Classroom observations took place in teacher participants' classrooms during each site visit. Each classroom observation lasted at least thirty minutes to an hour. Teachers also shared their thinking during hallway and side conversations. These additional conversations helped to clarify teachers' actions as well as their thinking and were valuable sources of information throughout the course of the study.

Document Collection

In addition to observation notes, many documents were collected and analyzed. These documents provided information about the types of data teachers were using as

well as information about district and school foci. Documents included formal assessment results, benchmark assessment results, informal assessments, homework, classroom assignments, and teacher logs. Teachers, principals, and the area superintendent voluntarily provided these documents.

All three forms of data (interviews, observation notes, and documents) were analyzed and used to triangulate findings.

Data Analysis

A constructivist grounded theory approach was used to identify themes that emerged as a result of the data that were collected. Charmaz (2006) explained, "A constructivist approach places priority on the phenomena of study and sees both data and analysis as created from shared experiences and relationships with participants" (p. 130). During the seven months of interaction with the research participants, teachers and principals continued to share their thinking and experiences with the researcher. The themes and patterns from the data collected during this time gradually emerged and ultimately shaped the findings for this research study.

Transcription and Coding of Interviews

All interviews were transcribed, coded, and patterns and themes were identified, first within each case and then across cases. Glesne (2006) described coding as a "time when you think with your data, reflecting upon what you have learned, making new connections and gaining new insights, and imagining how the final write-up will appear" (p. 154). Because data collection took place over the course of seven months, themes and patterns emerged over time and a potential list of codes were developed as these themes took shape. After each site visit, a journal was kept summarizing the observations about

each teachers' data use as well as the potential themes that were beginning to take shape. These journal notes were used to develop the codes used in the final data analysis process.

A qualitative data analysis software program called HyperRESEARCH was used during the data analysis process. This data analysis tool helped organize the interview transcriptions, code the interviews, and sort each case by the coded statements. Each participant's interviews were printed and sorted according to the coded responses. This allowed for the examination of data by teacher, by school, and by statements made under each coding category. The cases were then compared and contrasted for patterns and themes within and across schools.

Classroom Observation Notes Analysis

During each site visit, notes were taken on observation protocol guides. The data from these visits were analyzed using the same codes and themes used to code the interviews. The observation notes were then sorted according to themes and analyzed alongside the data from the interviews. This process allowed for a deeper understanding of teachers responses during interviews as well as the actions they took in their classrooms. Observation notes also provided information about the interactions that teachers had with students, including scripted conversations of teachers working with individuals, small groups, and the whole class.

Document Analysis

Principals and teachers provided various documents throughout the course of the research study. These documents included different assessment results, teacher logs, class assignments, and other documents that teachers and principals thought illustrated

teachers' use of data. The area superintendent also provided documents that described the district focus, which was valuable in understanding the overall district context as well as the context of the individual schools. Document analysis was done simultaneously along with analysis of interviews and observation notes since many of the documents were referenced during the interviews or provided during classroom visits. The documents included in this dissertation helped to illustrate a particular point that a teacher made or illustrated the types of data that teachers or principals referenced in their statements.

The Use of Pseudonyms in Findings

Efforts to hide the identities of the district, schools, and participants have been taken in order to protect the participants as much as possible when writing the findings for this study. Pseudonyms have been used for the names of the schools as well as for the names of the principals and teachers. In addition, grade level information as well as any other teacher descriptors and indicators have been purposely left out of teacher quotes and descriptions in order to keep the identities of participants as anonymous as possible.

Positionality

As a former teacher and school administrator, my positionality had a great deal of influence on this research study. First, I gained access to the participating school district through my relationships with the principals as well as relationships with district office staff. The district was more willing to consider the research study and assist with the research application process because of my former employment with it. The principals at the two school sites were former colleagues of mine and trusted my intentions. These

relationships helped to open the right doors and gain access to teachers' classrooms with few obstacles, other than the lengthy district procedures.

Second, because I already had relationships with the principals, I was able to have honest conversations about their schools, their use of data, and teachers' capacities around data-driven decision making. Principals indicated that they trusted my intentions and wanted to learn from the work that I was doing. By coincidence, one of the participating teachers was the parent of one of my former students back when I was an acting administrator in the district. The relationship that I had with this teacher was thus enhanced by my previous interactions with her family, which may have had an impact on the information that this teacher was willing to share and provide for the purposes of this study.

Finally, because I was a past employee of the participating district, I had a better understanding of the district and school contexts. I understood references to past educational reform efforts and understood the references made about curriculum and assessments. I also had prior experiences with the neighborhood and school communities in which the participating schools reside. This knowledge aided in my data analysis and interpretation of participant statements. The teachers also knew that I was a former teacher and employee with the district. This common, shared experience with the teachers may have had an influence on what they were willing to share with me as well.

Although it took over nine months to secure the district and schools for this research study, going back to my former district proved to be beneficial. My positionality greatly affected access to the district and schools as well as forming trusting

relationships with the participants. It also helped me with data analysis and interpretation in terms of understanding district and school contexts.

Limitations

There were several limitations to this research study. First, there were limitations that revolved around the school site visits. During several visits, unplanned teacher absences affected my ability to conduct classroom observations and interact with them. During those times, more time was spent in other teacher participants' classrooms, which was certainly beneficial, but not ideal. Teacher absences also affected my ability to conduct final interviews. Although all site visits were planned in advance, teacher illnesses and absences could not be avoided.

Second, there were travel and time constraints that limited my ability to collect additional data that had the potential to contribute to this study. Because I no longer reside in the San Diego area, conducting school site visits was limited to my ability to travel to San Diego. For example, I was not able to attend planning or professional development meetings that occurred on days that I was not in the San Diego area. Thus, data collection was limited to the dates and times that were arranged in advance.

Third, my positionality as a former teacher and school administrator may also have been a limitation to this study. Although, my positionality may have been beneficial in terms of access and participant relationships, it may also have limited my perspective as a researcher and may have affected the interview responses and classroom observations. My conceptions about teaching and learning as well as my prior experiences with the district, schools, and principals influenced the way I interpreted and analyzed the data. In addition, the fact that I was a former teacher and administrator may

also have affected the kinds of responses that participants gave to interview questions as well as their overall attitudes towards me as a researcher.

Finally, this research study focused on classroom teachers from a single district and within only two schools with their own unique contexts. Therefore, the findings from this research study cannot be generalized to all teachers in all districts and schools. These findings are also limited to the experiences of this select group of elementary teachers and cannot be generalized to teachers at other grade levels (middle or high school) and also cannot be generalized to other types of schools such as charter schools or private schools. However, the value of a case study is that the knowledge gained from one case can help make knowledge accessible to others (Donmoyer, 1990). In other words, understanding a particular experience may help make sense of other similar, but different experiences.

Significance of the Study

The purpose of this study was to gain a better understanding of classroom teachers' engagement in data-driven decision making practices at the micro level. Although there were limitations to this research study, the understanding gained by doing this research contributed to the education field and our knowledge of teachers' engagement with data-driven decision making. More specifically, this research addressed the ways that teachers used data in their daily classroom practice. This study provided knowledge about the types of data that teachers chose, how they used data to make decisions, and how they acted on data in their instructional practice. This research study also described how contextual and cultural factors as well as issues around autonomy and teacher ownership may have influenced teachers' use of data. The findings from this

research study have implications for future research as well as implications for districts and school leaders as they look to improve data-driven practices at school sites.

CHAPTER FOUR

FINDINGS

The following chapter will explore the research findings in depth and answer the four proposed research questions. Efforts to hide the identities of the district, schools, and participants have been taken in order to protect the participants as much as possible when writing the findings for this study. The names of schools and participants have been replaced by pseudonyms in order to protect their identities and keep their anonymity. In addition, grade level information as well as any other teacher descriptors and indicators have been purposely left out of teacher quotes and descriptions in order to keep the identities of participants hidden.

Description of the District, Area, and Schools

The participating school district is a large, urban district in San Diego County. The district serves over 132,000 students with 118 elementary schools, 24 middle schools, and 26 high schools as well as more than 44 charter schools and other atypical types of schools. The district is extremely diverse with students representing more than 15 ethnic groups and more than 60 different languages and dialects.

Over the past 15 years, the district has experienced major educational reform, has had several different superintendents, and has gone through restructuring and reorganization in terms of school management. Currently, the district is divided into six areas, each with its own area superintendent.

Description of the Area and Area Focus

The two participating schools in this research study belong to the same area, Area B, and are under the same area superintendent leadership. Area B is the highest

performing area in the district and consists of 25 different schools (elementary, middle, and high school). Half of the schools have Academic Performance Index (API) scores of over nine hundred points, while the other half, with the exception of one school, score in the eight hundreds. (API scores are used as a measure of school performance on California standardized tests.[1])

The area superintendent, who has been working in this role for seven years, describes the district's goals as a five year strategic plan focused on 12 indicators of quality school. Some of the indicators include quality leadership, quality teaching, broad and challenging curriculum, professional learning communities, and digital literacy to name a few. The focus was to develop quality schools in every neighborhood, which explains why most of the practice of busing children from different parts of the city to schools outside of the neighborhood has stopped. The district is also preparing to adopt the federal Common Core standards, although the area superintendent explained that this would fall under the category of broad and challenging curriculum. As for Area B, however, they honed in on three particular indicators to guide their work: quality teaching, broad and challenging curriculum, and the development of professional learning communities. Specifically, Area B wanted to focus on improving classroom instruction and spent the previous year working on developing questioning strategies that would evoke critical thinking and problem solving. Area B also used the book, *Teach Like a Champion* (Lemov, 2010) to guide their professional development. As a guide for principals and teachers, the area superintendent summarized the chapters in the book and highlighted the key instructional strategies. In addition to the book, the area

[1] For more information on state standardized API information, see http://www.cde.ca.gov/ta/ac/ap/index.asp

superintendent developed a document highlighting levels of questioning and Bloom's taxonomy to help teachers and principals understand how questioning can guide student thinking. Once a month, the principals in Area B along with one of their lead teachers attend a full day professional development centered on these instructional practices. The idea is that the principals and lead teachers would go back to their school sites and train the rest of the staff on how to implement these instructional strategies. To hold schools accountable for Area B's instructional focus, the area superintendent along with groups of different principals would conduct school site visits, called instructional rounds, using an observation tool that they developed. Although the principal professional development meetings are mandatory for principals, there is a great deal of variation in how principals are taking up this work. Some principals have embraced Area B's focus, working hard to develop teachers' capacity. Others, however, have not been as receptive. The area superintendent described this in the following way:

> I don't ding them if they don't do it because it's not a required mandate of our district, this work. So I am very careful...right now, we're really not in a district that's into mandates. There's just not that stomach in our district [for that] and so I'm not going to go out there on a, "this is a mandate and you must do this." I don't think that works anyway and I think it goes back to the [previous superintendent] years.

It is important to note that the reference about the district *not being into mandates* is a reference back to a previous district-wide reform effort, headed by one particular superintendent, that was controversial and heavily focused on teacher mandates. Although it is many years later as well as many superintendents later, references to past policies and district demands are still evident amongst district staff, principals, and teachers.

The area superintendent also explained that principals and teachers have easy access to data, especially with the data tools that are made available to them. Data tools include a computer system called Data Director, which allows easy access to data as well as the capability to disaggregate data in many ways, as well as various computerized assessments in literacy and math. However, when asked if the principals were data savvy, the area superintendent explained, "I think my elementary principals are like *way* data savvy. I think my middle school principals are data savvy. I think my high school principals are football savvy." Although the area superintendent was making a joke, he continued to describe how high school principals have been more resistant to Area B's instructional focus. The area superintendent explained that he has taken steps to bring high school principals to visit elementary schools in order to show them the kind of work that occurs at the elementary level, including the types of teaching strategies that would help improve practices at their own school sites. Based on Area B's instructional focus in the past year, the area superintendent stated that all of the schools in Area B showed improvement in state standardized test scores.

Description of Baker Elementary

Baker Elementary is a K-5 elementary school serving approximately 380 students in 18 classrooms. Baker has a student population that predominantly lives in the school neighborhood, although a few students choose to attend Baker from other areas in San Diego County. The school is made up of approximately 41% white, 34% Hispanic, 7% African American, and the rest a mix of other races. Baker also serves a school population of 49% socioeconomically disadvantaged and 25% English-language learners.

The school has a mixture, however, of students coming from upper middle class families as well as families living in government subsidized housing.

Description of Hoover Elementary

Hoover Elementary is a K-5 elementary school as well as a magnet school with a focus on communications. Hoover serves approximately 513 students, with one-fourth of the students living in the community and the rest of the students coming from 56 different areas across San Diego County. Students are able to choose to come to Hoover because of its magnet school status. The school is made up of approximately 53% white, 28% Hispanic, 5% African American, and the rest a mix of other races. Hoover also serves a school population of 24% socioeconomically disadvantaged and 9% English-language learners.

Major Findings

The findings for this research study will be organized around the original research questions which include the following:

1. Why and how do select classroom elementary teachers choose specific data to inform their practice?
2. How are data being used by these teachers to make instructional decisions?
3. In relation to data use, what practices support instruction? What areas do these teachers seem to struggle with?
4. What accounts for the variations in this select group of elementary teachers' ability to use and make decisions around data within and across schools?

Research Question #1: Why And How Do Select Classroom Elementary Teachers Choose Specific Data To Inform Their Practice?

The first research question can be answered in four ways. First, teachers used many different forms of data to inform their work. Second, teachers used data in different ways and for different purposes. Third, teachers created assessments in order to get the data they needed. Fourth, teachers also chose not to use certain assessments because they did not find these data informative or useful for their practice.

Before addressing the first question in this research study, it was important to ask whether teachers in this research study actually used data in their work. Fortunately, in the schools that participated in the study, data were readily available and used by principals and teachers. The school district had implemented a data tool called Data Director which allowed educators access to different types of data as well as the capability to aggregate data in different ways (whole class results, individual student results, classroom results, etc.). Along with the CSTs, which are the California state standardized tests, the district also required teachers to use district-developed benchmark assessments for literacy and math. The benchmark assessments were given three times a year for each of the subjects and Data Director allowed for immediate access to benchmark test results. Both schools used and had access to a number of different types of assessments. For instance, the following assessments were used widely by both schools and some were even required by the district to be given to students at specific times during the school year. These examples included reading assessments such at the Developmental Reading Assessment (DRA) and Analytical Reading Inventory (ARI), an assessment for English Language Learners called the California English Language

Development Test (CELDT), and an assessment for kindergartners and 1st graders called the Writing and Reading Assessment Profile (WRAP). Other types of assessments were available but not necessarily required by the district. These assessments included computer programs such as the Measures of Academic Progress program (MAPS), Learning Upgrade, and Achieve 3000. These computer programs included activities for students as well as diagnostic tests for literacy, math, or both depending on the program. These programs were also used individually by students throughout the school year to provide additional practice and build student skills. These programs gave teachers data on student progress and the data were easily accessible and available.

Teachers at both Baker and Hoover expressed that they felt data-driven decision making was important and helped to inform their work. For instance, Gloria from Baker said:

> It helps me. It drives my instruction and planning...[for example, if] everybody had problems with number sixteen, I know I need to work more on variables or something like that. That tells you what you need to re-teach...data totally drives my instruction.

Similarly, Kristy from Hoover said:

> All forms [of data], informal and formal drive my instructional decisions as well as the standards...the needs of my students need to be met. I do feel these decisions make a difference in my students.

Jennifer from Baker said:

> You have to have feedback about how they're doing to know where to go and so yeah, I use it in formulating where I am going next. If they already know something there's no point in me teaching it again. If they're struggling with something then I need to revisit it. You know, so it lets me know.

The statements from these three teachers illustrate that teachers generally thought that data-driven decision making was an important aspect of their work. Their statements

reflect that data use was necessary for planning instruction and meeting the needs of their students.

Teachers use many different forms of data.

Based on interviews, classroom observations, and document analysis, it was clear that teachers at both schools used many data sources to inform their instruction and chose different forms of data to inform them about student progress throughout the school year. Types of data included formal assessments, such as CST results and district benchmark exams, or classroom type of assessments such as chapter or units tests. Data also included observation notes, anecdotal notes, and class assignments. For instance, Kristy from Hoover described the types of data that she used throughout the school year in the following way:

> In elementary school, they actually create a card and on the card are just different things about each kid...so it might be they are really strong in math, they are really strong in basic skills, so you have some ideas right off the bat. Then ...there is a language arts assessment that I'll pull up...it looks at vocabulary, reading comprehension, and phonics. So it gives me some idea if the kids are struggling in those areas. It's just a beginning kind of idea. And then throughout the first weeks of school there's a lot of me going out and talking to kids and assessing kids, looking at writing and listening to them read and talking to them about books. For me, assessment is constantly going on throughout the entire school year. When I look at benchmarks or state tests that we take in math, I am constantly analyzing...where are the pitfalls here, where is the majority of the class falling down? What do we need to go back and redo?

Kristy's statement identified four different forms of data, both formal and informal, that she used to inform her planning and instruction. Data included notes from a student's previous teacher, a language arts assessment, data gathered from teacher-student interaction, and district benchmark tests. Similarly, Ann from Baker also described the many types of data that she used to assess students:

> The assessment that we give them in the very beginning...has just some basic

> skills on it, that's kind of like an entry level how much do they know. And then as the year goes on, we have other things in place. We have a program called the WRAP. It's actually an assessment. We look at beginning sounds, rhyming words, things like that...then we test them in the beginning of January with what's called the DRA, the Developmental Reading Assessment, and so that's going to be done again in June. Now that's a real hard core basis for looking at growth because you want them to get through several levels so that by the end of the year, you're sending them on to [the next] grade at a certain level.

Ann mentioned three different types of data used throughout the school year including a basic skills assessment, the WRAP, and the DRA. The basic skills assessment was teacher developed, the WRAP was a district-provided assessment, and the DRA was also district-provided but teachers had the flexibility to give the assessment whenever they chose. Again, her statement illustrates that she relied on many different forms of data to inform her work.

Principals at both Baker and Hoover explained that data-driven decision making was a part of teachers' work and that the teachers had many types of data available to them throughout the school year. For instance, Tracy, the principal of Baker described the following forms of data available to teachers at Baker:

> Right now we have the district benchmarks...we have something called Learning Upgrade that we're using which is a computer based program, there is a math component and a literacy component...[and] 5th grade this year is doing a pilot program called Achieve 3000, that's a literacy program intended to increase their lexile level...and then the CST at the beginning of the year...the CST and the CELDT.

Similarly, Cindy, the principal of Hoover described the types of data available to teachers at her school site:

> Teachers do formative assessments in the classroom, but our big assessments would be the CSTs, which will be the common core tests eventually. Then you have the benchmarks. We also do a thing here called MAPS testing, it's not mandatory but you get specific information about [each] kid...it's a really nice baseline to compare it with the CST from last year...and the other assessments that we use are teacher created ones...Then, we also do the Learning Upgrade,

> which is supported by the district, and then some of the other assessments [like] the DRA and the ARI.

Both principals listed forms of data that were common to both schools, including CSTs, district benchmarks, and the computer program Learning Upgrade. Tracy also mentioned the use of Achieve 3000 and CELDT at Baker while Cindy listed the DRA and ARI reading assessments at Hoover, although CELDT, DRA, and ARI were actually available at both schools. The principals' descriptions supported the teachers' statements that different types of data were used throughout the year, some being formal and some informal and classroom-based.

Teachers use data in different ways and for different purposes.

Not only did teachers use many forms of data, they used data in different ways and for different purposes. Jennifer from Baker described how she used district compiled data in the following statement:

> I do use district compiled data to make plans for an upcoming year. It helps me see trends where students will need more instruction. It also points out those questions which most students miss. I can analyze those questions to see if they are representative of the required standards, bad questions, or questions that are above the standards.

In this statement, Jennifer talked about how she used district data, such as benchmarks and CST results, for overall planning purposes and big picture type of decision making. Jennifer explained that she analyzed assessments by aligning test questions to the appropriate grade level standards and looked for trends in student performance that helped her with grade level planning. However, Gloria from Baker described a more informal and intimate use of classroom data. Gloria stated:

> Sometimes I give them a little quick test to see if they understand certain concepts. And again, I rely on going around and looking in their math journals when they are working, [I look at] their homework [and] their class-work. I look

> at that daily to see what they understand and what they need help on. In literacy, I mostly assess the same way, circulating around the classroom, the benchmark test, working with the child, conferencing in the mornings. I work with each child...I write down particulars. Like today, this child needed to know what this word meant or needs to work on inferencing or doesn't know their phonics. So that's what I use for assessment also.

In this statement, Gloria described how she used daily classroom work to inform her instruction. She described how she collects data by looking at student journals, conferencing with them, observing their behaviors, and writing down particular notes about individual student understanding. Gloria explained how she constantly collects data in the moment as she observes student work. Mindy from Hoover talked about how she used both formal and informal types of data to inform her work in the following statement:

> So for reading, I use my small group notes and also DRAs to determine reading groups like groups that need a lot of phonemic awareness support. I'll pull them and do that. I'll use my math observations, whether it's a paper that I'm looking at or a project with small groups. And obviously, if there is a majority of the whole class that didn't understand it, I'll know that I need to go over this again.

Mindy's use of both types of data, the more formal DRA reading assessment as well as anecdotal notes, provided information that would help determine reading groups based on specific areas of need, such as phonemic awareness. Mindy also described how classroom observations helped her determine student understanding and the needs of the whole class.

One teacher in particular, Julie from Hoover, was extremely savvy with data collection and data use. Her use of different types of data was not only used to inform her instruction, it was also used to communicate to other teachers, parents, and administrators a particular child's strengths and weaknesses. Her idea of data use was to gather information that would allow her to know the whole child. She wanted to be able

to tell the big picture of the child and she collected and used data for different purposes. When asked about her data use, Julie provided a list of data that she used throughout the school year and gave examples of how she used data to inform her work in many different areas. For instance, she used data to support Individualized Education Program (IEP) meetings, Student Study Team (SST) meetings, parent conferences and even used data to communicate with a child's physician. In these documents, Julie reports a student's results on assessment tests, but also uses specific classroom examples to add-on to the formal data results. She then offers her interpretations of the information as a whole and her recommendations for support.

Teachers create assessments to get data.

Although teachers at both Baker and Hoover seemed to have a wealth of data available to them, these data were not always sufficient in providing information that teachers needed. In certain instances, teachers described how they needed to create assessments in order to get the kinds of data they needed to do their work. For instance, Mindy from Hoover stated:

> And then I myself also have an "addition to the WRAP." That's what I call it. It's a math assessment that I've created with other teachers at [previous school] that I use throughout the year just so I can measure progress. I have to sit with each child individually and I am taking notes while they're taking the assessment. I keep it all year. I use a blue pen the first time, and then the second time I use a purple pen. I keep it. I don't ever send it home. I share it with parents during conferences.

Mindy described how the district-provided WRAP assessment did not have questions that addressed students' abilities in mathematics. In order to get this type of data on math ability, Mindy created a separate assessment that she used as a supplement to the district test. Both the WRAP and Mindy's "addition to the WRAP" required an up close and

personal assessment between teacher and student. Similarly, Kristy from Hoover described the development and use of class assignments to help her gather the data that she needed. Kristy described this in the following statement:

> Recently, we wrote a character analysis paper. After reading them I realized that they really needed help with how to figure out what to write that would support their thinking even though we had done a lot of oral work surrounding this. I also realized some students were still struggling with how to write a topic sentence. So I pulled out a graphic organizer that would help us organize our thoughts as we started to deal with persuasive writing. It forced them to think of ideas that would support their reasons as well as help them to write topic sentences since they would know what each paragraph was to focus on. I learned which students really struggled with just being able to access the text they were reading as well as those that did a great job of accessing the text but struggled with the written aspect of the assignment. It also informed me who was still struggling with the idea of character traits in general. This assignment hit a lot of birds with one stone.

Kristy's statement can be broken down into two separate processes. First, Kristy examined a writing assignment that her students completed and found that students were struggling. In order to gather more specific data on what individual students needed, she created another classroom assignment to break down students' thinking process which helped her determine exactly where students were struggling, whether it was accessing the text, writing, or understanding the concept of character traits.

Both Mindy and Kristy had specific instructional needs that were not met with the data that they currently had available to them. In order to meet their needs, they both created ways to gather data that would help them make more informed instructional decisions.

Teachers choose *not* to use certain data.

Although teachers chose data and created data that met their particular needs, they also chose *not* to use data because they did *not* meet their needs. Gloria from Baker, for example, described how she thought tests were not always meaningful:

> Sometimes you see problems in the test and then looking at data is meaningless...sometimes when [the tests] word things wrong or I don't agree with the way that the test works, then I don't think that data is meaningful....when they don't have good questions, I don't think the data is worthy of my time.

In this statement, Gloria was describing problems with the quality of test questions. Essentially, Gloria was emphasizing that if the quality of the assessment was not good, then the data were also not good and thus, she did not find this kind of data useful.

Kristy from Hoover, on the other hand, described a different type of situation. Kristy gave an example of how her entire grade level team of teachers used a computerized math assessment program called MAPS throughout the school year. Kristy, however, refused to use this math assessment, even though her colleagues all used it. Kristy defended her stance in the following way:

> There are a lot of people that use another system that came in...MAPS testing...it's [taken on the] computer. You go in and take it. For me, I struggled with it, so I was the only upper grade teacher that didn't do it...I can't see any writing. I can't see how a child thinks. All I can see is getting a number the computer assigned to them.

Kristy refused to use the math assessment program because she did not find the data generated from the assessments useful for her instructional planning. She thought that the data generated were only numbers and the data did not reveal students' writing or thinking process. Kristy felt that the data generated from the MAPS math assessment could not help her authentically assess student understanding of math concepts.

A third reason why teachers chose not to use certain data was because they thought that some data were repetitive. For instance, Robin from Baker said:

> Sometimes it's like go on Data Director and we'll do this and this and this, and it's like, this is wasting my time because I already know it. A lot of times I already know it before I get the pieces back.

In this statement, Robin was making the point that not all information from data was new, and thus, spending the time to analyze data that essentially provided information that she already had was not useful for her work.

Although all three examples illustrate examples of teachers who chose *not* to use particular data, it also shows that these teachers were thoughtfully considering data and the worth of data in their work. In order to determine data's meaningfulness, teachers had to engage with the data in the first place. Even though they chose not to use data, they were actually still engaging in data-driven decision making practices.

Research Question #2: How Are Data Being Used By These Teachers To Make Instructional Decisions?

The first question revolves around why and how teachers choose data, essentially discussing that they *do* use many forms of data and they use data for different purposes and to meet different needs. The second research question, however, requires a deeper look at teacher data use. This next section examines how teachers use data in greater detail and in greater depth.

Interviews, classroom observations, and documents revealed that teachers were using different types of data to inform them about student understanding. Information was coming from what we traditionally think of data, both formal and informal types of data. This included formal assessments like CST results and benchmark exams as well as

classroom data such as homework, chapter tests, and class assignments. However, teachers also gathered in-the-moment data. These data were gathered and used as the teachers interacted face-to-face with students in the classroom.

The answer to research question #2 depends on the type of data collected. One of the teachers at Hoover Elementary, Julie, described how she was planning on implementing a photography unit to incorporate the arts with writing and math. She was describing how students were going to take snapshots of their experience hiking up a mountain and then write about the experience as well as use the experience to discuss math problems. Julie's explanation of the photography unit helped to formulate a description of a certain type of data that teachers were using. This type of data will be referred to as *periodic data.* Periodic data can be described as data that gives the teachers "snapshots" of student understanding at a particular moment in time. Teachers were using periodic data to gather information about what students knew and were able to do at a given moment. They used these data for decision making involving instructional planning, grouping of students, identifying areas of strengths and weaknesses, determining trends, and looking at progress of groups of students and individual students. Traditionally, this is what would be considered data-driven decision making, using data such as test results or even logs of student understanding over time to make classroom decisions.

However, teachers also used a different kind of data that was based on in the moment real-time teacher to student interaction. This type of data will be referred to as *real-time data.* This type of data revolves around teacher questioning and student responses. Teachers were gathering data about what students understood and were

making decisions in the moment about how to guide students toward understanding. This type of data gathering, decision making, and responding was heavily dependent on teacher capacity.

Teacher capacity involves knowing the next question to ask or next activity to give, right then and there. It involves teacher pedagogical knowledge. In order to describe this type of data, an analogy will be used from the defense contracting business. The term *real-time data* is used by the defense contracting business and can be described in the following way: When engineers want to know *approximately* where a target is, they gather a particular type of data that would tell the location of the target's general vicinity or area. When engineers have a moving target, however, they gather real-time data which would provide them with enough information that would allow them to hit the moving target. This analogy can be used to describe data use for teachers. For teachers, periodic data can tell general trends, patterns, and even information about specific students at a given time, which is like data that tells the target's general vicinity. Real-time data, however, is like the moving target. Real-time data tells teachers what is happening in the moment, when the student is sitting in front of them and trying to make sense of a new concept or learn a new skill. In order to hit the moving target, teachers have to be able to gather data in real-time, process it, and respond appropriately. The following section will describe how teachers use both periodic and real-time data for decision making.

Periodic data.

Periodic data can be described as data that provides information about students at a given point in time. This type of data can be summative, formative, formal, or

informal. Examples of periodic data include results from state standardized tests, district benchmark assessments, reading inventories like the ARI and DRA, and unit or chapter tests. Periodic data may also include class assignments, homework, and teacher logs.

Teachers from both Baker and Hoover used periodic data in different ways. For instance, Gloria from Baker said:

> What I like about [the principal] is that she gets the benchmarks and we go specifically over different items like where the kids as a grade level had problems. You know, what are we doing well? What do we need to work on?

In this statement, Gloria was describing the use of benchmark data to give an overall picture of how students perform at a given grade level as well as to determine if there were trends in the data that would point out grade level problems. Similarly, Kristy from Hoover said:

> The data that comes from Data Director...comes in multiple ways...I can look at the whole class. What are the concepts that we really need to go back and look at as a whole class? I literally look at the test itself and look at what they had done on it and where was the error...why did [the students] miss them?

Kristy used data to inform her of the concepts that she needed to go back and revisit or reinforce with students. Similarly, Julie from Hoover also looked at whole class trends. Julie stated:

> Data comes pretty fast. Then you just go right on the computer and get the results. You can get the whole class. And then it kind of breaks [the data] down by the standards and you can look at that. It's good because we've looked at it as a grade level and [we] go back and look at the benchmark...[when students miss a question], we have to look at it and say, was it the question or was it developmentally the kids aren't there yet?

In Julie's statement, she explained how benchmark data was used as a focal point for discussion at grade level team meetings. Gloria, Kristy, and Julie all described how data were used to help determine trends in student performance. Data provided information

that allowed them to make inferences about the academic performances of whole groups, small groups, and individual students.

Teachers from Baker and Hoover described how they used data to track whole group and individual student progress over time. For instance, Ann from Baker said:

> I keep a little notebook that has the kid's name on the top...when they're writing I can conference with several kids a day and make notes about it...[It's helpful] knowing the standards and what you want to see kids progress with. Those notes are helpful to me when it comes to a time when I need to look at [them] because you always know who needs what...if you don't start to be real careful about keeping notes about the kinds of things you're seeing them struggle with and then make progress with, you forget because there's 24 of them. It sounds simple, but all those things are the little teeny pieces of the puzzle that fit together [to determine] what they're learning.

Ann also shared some examples of the types of notes that she wrote about each child in the notebook that she mentioned in her statement. Some of these notes said things like, "Knows many letters and sounds and will sound out words" or "can order numbers to ten." Other notes were more behavioral such as, "time on task is poor" or "does not work independently." These notes had dates next to them so that Ann could easily track student performance over time. Similarly, Melissa from Hoover said:

> When I am observing small groups, I am taking notes. I have a folder with lots of notes with how they did, what strategies they're using, what they need to work on. Observing them that way, in small groups and individual...you know, seeing their work. I take a lot of anecdotal notes. I record a lot of stuff...what they can do, what they need to work on, what they cannot do consistently...or I will take a quick note on a student depending on what I observe

It is important to note that both Ann and Melissa described the use of anecdotal notes to track student progress in their classrooms, illustrating that data use does not have to be formal types of data. Both teachers also described the use of the DRA reading assessment to determine students' reading levels throughout the school year. Mindy from Hoover said, "DRA is another thing that I use. It's like a reading tool...I try to do it

every once in awhile for each kid so I can see their reading growth." Similarly, Ann described the DRA in more detail. Ann explained:

> It's simple. There's a little reading. It's called the writing record. You just have a little sheet in front of you and it's scripted as to what you say about the little book. Have the kids look through it and then there's questions you ask and it's based on percentage too of how many words they struggle with, how many they completely miss, and it's looking at syntax, it's looking at comprehension, and all those things. As the levels get higher and harder it's more and more about the comprehension...there could be kids that can decode everything beautifully and read it too and not have a clue [about what it means]. Then, there's a code indicator as to where [the students] are and what kinds of books you want them to [have] for them to be successful but at the same time challenged.

Ann's description also showed how extensive some of these assessments could be, especially when the assessments require one-on-one teacher and student interaction. As a whole, data were used by teachers to track student progress of specific skills as well as to determine their appropriate reading levels over time, with the goal of preparing all students for entrance into the next grade level.

Periodic data were also used to target students for interventions or determine which students may need extra support. Jennifer from Baker described how she analyzed benchmark data and found that certain students missed questions that called for them to read a passage and reference notes from a sidebar. Jennifer described what she did next in the following statement:

> I would take those kids that are not reading the sidebars...I pull them for a guided group and I would take just a small reading piece that has a sidebar and I would specifically ask a question from that side bar after they had read [the passage] to see who's going back...then we would discuss it.

Jennifer used data to help her target students for support with a particular reading skill. Jennifer also described how she targets students by using Data Director, the data management tool provided by the district. Jennifer explained:

> So right now I have gone on Data Director this year and I know really well how my kids did on the tests. I have already hand scored it and I know I have five kids that struggled and everyone else is pretty proficient, which was good considering they're such a swirly group.

The second statement from Jennifer showed that she knew exactly which five students were going to need extra support and attention. In both of these statements, Jennifer used two different sources of data to target students that needed additional support. These may or may not have been the same students. Thus, different forms of data ensured that Jennifer would catch students in need of additional help. Jennifer was able to use data to guide her with planning and instruction for particular groups of students.

Finally, periodic data was used as a confirmation of student progress and understanding. For instance, Kristy from Hoover explained

> Data, [those are] just numbers...this is the range you're in, these are the skills that you need to be doing. I'm thinking that will give me some ideas, but I can also get the same thing reading their tests or reading their writing each day, or whatever I'm collecting.

In this statement, Kristy reflected her thinking about how data confirmed what she already knew from daily interaction and classroom activity with students. She was not discounting data since she said that the data gave her some ideas about where students were, but she was making the claim that she can get the same information without analyzing data in the form of numbers. Similarly, Julie from Hoover stated, "I think it's just another confirmation of where they are because by the time we get those benchmarks, we've had enough under our belts with them." In this statement, Julie was referring to having plenty of experiences working alongside students and that these experiences already informed her of their progress and ability. She described data as "just another confirmation." This statement was neither positive nor negative, but it

implied that teachers used data as a sort of checkpoint and the additional information gathered from data matched what they already knew.

In sum, teachers from both Baker and Hoover used periodic data throughout the school year to help them determine trends, plan for whole group or small group instruction, track whole group or individual student performance, determine students' reading levels, target students for interventions or support, and confirm their knowledge of student performance. Periodic data were used as a starting point, a checkpoint, as well as an endpoint, and teachers at both Baker and Hoover readily used these data to help them make instructional decisions.

Real-time data.

Teachers also used another type of data referred to as *real–time data*. This type of data is the in-the-moment data that is collected while teachers and students are interacting. The use of real-time data is based on student responses (written and oral) and provides teachers information about how the lesson is going at a given moment. Data-driven decision making using this type of data requires teachers' pedagogical knowledge and content knowledge. It involves teachers' ability to use questioning strategies to dig for student understanding as well as their ability to respond to students in a way that furthers their understanding. Teachers' decision making based on real-time data helps them with planning instruction for that exact moment.

Real-time data were used in four different types of teacher-student interactions. The first was when teachers walked around the classroom and had conversations with students as they were working on class assignments. Teachers were looking over students' shoulders, checking their journals, and reading their writing. Teachers were

asking individual students questions about their thinking. For instance, Gloria from Baker was working with her students on a writing assignment focused on using figurative language. Gloria was circulating around the room and talking to students about their writing. She asked the students the following types of questions:

> Can you show me in your writing where you have hyperboles or idioms? Everything you have here is literal...where are your figurative language? Can you show me?
> Here's a great example of figurative language, this is personification...great one. Did you indent your paragraph? Where is your heading?

As Gloria was circulating around the room, she was checking the work of individual students, reading their writing, and either asking a question or providing some type of feedback to students. In this example, Gloria was collecting data about student understanding in real-time and getting a sense of individual and whole class ability to use figurative language in their writing. Ann from Baker described the importance of real-time data in the following statement:

> A lot of what you do with [students] in all the areas is based on teacher observation and lots of small groups...they can't keep [written] data or information like older kids can...But we can certainly find out through conversations with them what their understanding is and if they're proficient or below that in areas.

Working with younger children, Ann described the need to have conversations with students in order to assess student understanding. The importance of real-time data for her grade level was particular important, especially since her younger students were not able to produce a lot of writing or able to take traditional types of assessments such as quizzes and tests. Kristy from Hoover had the following comment about the importance of collecting real-time data:

> My ongoing everyday looking at students, totally affects what I do and how I do it...yes, I'm exhausted because I am having to listen much deeper to what they're

> saying than just what a test will give me. So, when I am doing that assessment in my classroom, it very much drives my instruction.

In this statement, Kristy talked about how she gathered data by listening deeply to students and that this type of listening for student understanding informed her classroom instruction. She also made the point that a test, or periodic type of data, did not give her the same type of information because periodic data did not allow her to hear students' rationale for their thinking.

During one classroom visit, Kristy circulated around her classroom checking students' work on a math assignment. Kristy looked at how students were solving the problems, and she was essentially doing a quick check on their math skills. Thus, Kristy was gathering different types of data in-the-moment to inform her work. She explained that this gave her an idea of what students were doing and informed her instruction. She gathered data that she would use to adjust her instructional focus during the very next activity, which was to call them together to do math problems as a class.

The second way teachers used real-time data was during small group instruction. During these teacher-student interactions, the teachers' focus was on the understanding of small groups of students. In one particular instance, Jennifer from Baker worked with a small group of students for a guided reading lesson. The small group consisted of three boys and one girl. Jennifer distributed a reading passage and asked one student to read aloud to the teacher while she asked the other students to read quietly on their own. As this one particular student was reading, he had trouble pronouncing a few words. Jennifer helped him sound out the words and the child continued to read. Jennifer then moved to the next student who began to read to her. After each of the four students read to her, she watched the four students. Jennifer noticed the first student that she had called

on who had struggled previously with word pronunciation. It was evident that this student was struggling by the expression on his face; he looked confused. The teacher proceeded to read with him again, helping him with slowly pronouncing the words in the passage. Finally, Jennifer called the group back together. The following conversation took place between the teacher and the small group of students:

> T: What do you think was the main idea of the story?
> S1: It was about living in the marsh.
> T: Is that all? Just about living in the marsh?
> S2: About frogs trying to find a house.
> T: What do you think? (looks at another student)
> S3: Big frog was wiser.
> T: Was that what it was about?
> S3: No. It was about them finding a home.
> T: (looks back to first student) Now what do you think? What was the story about?
> S1: About finding a home.

In this first part of their interaction, Jennifer tried to listen for student comprehension of the text. Did students understand what the story was about? Jennifer then distributed a question page with multiple choice questions on it. Jennifer asked them to find evidence from the story to answer the questions and to underline their evidence in the text. Jennifer watched as each student circled their choices and underlined parts of the passage. She looked at their pages in order to check their responses and look at what they underlined. She watched their eyes and facial expressions. Jennifer proceeded to guide students with the question page in front of them:

> T: What happened first? What next?
> Students were busily working on circling and underlining.
> T: (Addressing one particular student as she looked at his paper) Did that happen first? Let's go back to the reading.
> T: (To another student) You underlined that it was hot. Does that tell me what happened to the marsh? Let's read that together again.
> T: (To another student) What did you underline here? How does that help you answer this question?

During this time, Jennifer listened for students' ability to order events from the story as well as their ability to comprehend the events. After the students were dismissed back to their seats, Jennifer commented:

> You can see who is paying attention to the passage and who is not...this is a really important skill, but hard to do...to go back to the story and find evidence. Jacob doesn't attend well. John reads really well, but doesn't attend well. Nancy and Stan just need the practice. Nancy was held back from last year because she really needs a lot more help.

Jennifer explained that these students were purposefully grouped together. Based on her observations of students' work and responses, she knew what these students needed both individually and as a group. She gathered evidence about student learning by listening to them, looking at their written work, and watching their body language and facial expressions. This is an example of real-time data use and decision making. Using these strategies, Jennifer was able to respond individually to each student in the group as they were practicing a skill that was difficult for them. Jennifer was able to decide what to do next based on what students were saying and doing.

The third way teachers used real-time data was during whole group instruction, when the class was gathered together to work on a specific skill, strategy or solve problems together. During these times, teachers asked questions and dug a little deeper for student understanding. For instance, during one classroom lesson, Julie from Hoover worked on math problems with her entire class. The whole class was sitting in the front of the room on the carpet and was reading a story problem that was on the board: There were 48 snowmen in one window and 69 snowmen in another window. How many more snowmen were in the 2nd window? The following teacher-student interactions took place:

T: Think of a strategy and make sure you are specific when you come up with a strategy.
S1: I would subtract.
T: Okay, tell me what I should do. (teacher follows student directions and writes what the student says on the board)
S1: I would put 10 sticks and then the rest dots...cross out and then see what's left.
T: Ok, sticks and dots. Who can tell me another strategy?
S2: I would start with four tens and count on two more for six. Then ones, I would add one more to make 69.
T: (writing what the 2nd student said on the board) There you go...using the "counting on" strategy. What else? Any other strategies?
S3: I would do it like you do in math...put one on top of the other...the algorithm.
T: Ok. (Teacher writes numbers on board in algorithm form) Now what?
S3: (no response)
T: (Addresses the class) Can you give me an example of a fact family?
S: (no response from class...lots of whispers)
T: How about with one digit fact families using small numbers? (Teacher writes on board 1+5 = 6, 5+ 1 = 6). What else? Can you give me an example of a fact family that goes with these numbers?
S: (mumbling but students do not seem to have an answer for the teacher)
T: We're going to need to review this. We're going to have to go back to fact families again.

In this example, Julie listened for student understanding of how to use various strategies to solve a story problem. However, as the students responded, she realized that they struggled with subtracting larger numbers. She tried to direct students back to using simpler numbers with what she called "fact families" but students seemed to still have trouble. This informed Julie that she needed to spend some time with her students to work on these skills. In real-time, Julie knew that students were able to give the correct answer to the math problem, but had trouble with certain strategies. Students seemed confident with drawing pictures of the story problem to do the math, but struggled with the algorithm. In a formal assessment or test, students would probably have been able to give the correct answer, but the teacher would not have been able to gather information about students' thinking process and method they used to get the correct response.

Mindy from Hoover also used real-time data to get a sense of students' understanding of vocabulary. Mindy called students to the front of the room to read a story together during a read-aloud: The following interaction took place between Mindy and her students:

> T: What does the word "bright" mean in this sentence, when the passage says "not too bright?"
> S1: It's the lightness
> T: Okay. When something is bright, it could be light. What else could it mean? Could the word "bright" mean anything else?
> S2: maybe being smart
> T: (Addresses the whole group) Put your thumbs by your chest. Thumbs up if you agree or thumbs tucked in if you do not agree. Can "bright" mean smart?
> T: (Scans students to see who has thumbs up or tucked in)
> T: Okay, let's read on and see if that makes sense...

In this very quick interaction with her students, Mindy stopped to do a quick vocabulary assessment. Her "thumbs up or tucked in" strategy allowed students to share their thoughts without having to share it with others, making it safe for students to be honest about their thinking. Mindy's interaction with students was an illustration of the way teachers can gather data quickly as to whether whole groups of students understand the instruction.

Kristy from Hoover also used whole class instruction to gather real-time data about students understanding in math. In Kristy's class, students were working on math problems together. The teacher and students were discussing different ways of figuring out percentages. The following problem was on the board: Find 30% of 500. One student wrote her response on the board, but had an incorrect answer of 1500. The teacher asked the girl and the class if that answer made sense. The following interactions took place:

> T: What happened to the place holder?

S: Oh, it's in the wrong place.
T: Okay...Let's do another one then. What about this? (Teacher writes 5/8 on the board) What can I do with this problem?
S: (One student begins to write five divided by eight on the board, but then gets stuck. Another student goes up to the board to help her finish the division.)
T: Does this make sense? Do you see how these problems are alike?
T: (Scans the room and calls on one student in particular) Valerie, does that make sense? Your jaw is open...are we okay? Valerie, talk if you are thinking it...others are too but just not saying it.
S (Valerie): I'm just confused...

Kristy proceeded to go through the steps again on the different ways to figure out percentages. After the students were dismissed to work independently, Kristy explained that Valerie scored a perfect score on the mathematics portion of the CST, which was a score of 600. Kristy said that Valerie could do algorithms and get the right answers, but could not tell the teacher why. Kristy said that Valerie "does math with blinders on" and always deferred back to doing algorithms. She also said that Valerie could "do" the math, but did not necessarily understand the math. In the teacher-student interaction above, Kristy paid attention to Valerie's facial expressions and body language as well as her ability to do the math. Kristy said that this kind of information could only be gathered through interactions with students. This kind of knowledge can only be gained in real-time, thus informing the teacher of the type of instruction that the students need in the future.

Kristy felt very strongly about her opportunities to gather real-time data through interactions with students. During interviews, Kristy gave several other examples of the importance of real-time data in her work. In one instance, she referred to students who could take the benchmark exams in literacy and could answer all of the questions on prepositions and prepositional phrases correctly. However, explained the following:

> But actually, when you looked at their writing, they don't use it [referring to prepositional phrases]. There is a disconnect between their actual writing and...what they do on a test. I'll use the number on the test, but I'm going to use it alongside everything else that I have because I want a true picture of the child, not just the [numerical] data.

Kristy was explaining that students' performance on an exam did not give her a complete picture of student understanding. Real-time data gathered through interactions and conversations between the teacher and students provided more detailed information about student understanding. Thus, in the example of Kristy's student, Valerie, the use of both periodic and real-time data together provided a more complete picture of this particular student's understanding of mathematics and thus informed Kristy of the type of instruction that she needed to give to Valerie as well as to the rest of the class.

In sum, both periodic data and real-time data were used by teachers at both Baker and Hoover. Both types of data were useful for teachers, but served different purposes. Periodic data informed teachers of student understanding at a particular moment in time and was used to determine trends, plan whole group and small group instruction, target students, track progress, determine reading levels, and acted as confirmation of teacher thinking. Real-time data were in the moment data gathered during teacher and student interactions. Real-time data were gathered as teachers circulated around the room and checked-in with individual students, during small group instruction, and during whole class instruction. Real-time data required teachers' ability to listen to student responses and make decisions about next steps.

Research Question #3: In Relation to Data Use, What Practices Support Instruction? What Areas Do These Teachers Seem to Struggle With?

When considering data-driven decision making for teachers, what teachers do well depends on the capacity of the teacher. Teacher capacities in this research study differed within and across schools, although teacher capacity as a whole was stronger at one school compared to the other. As mentioned earlier, all of the teacher participants in this research study engaged in data-driven decision making practices in some way. However, the actions that they took depended on their capacity to collect, interpret, and respond to both periodic and real-time data.

Teachers' capacity to use data well can be summarized in three ways. First, some teachers were able to use data seamlessly and incorporate data into many aspects of their work. Second, some teachers were able to provide opportunities for students to share their thinking and were able to guide student thinking by asking the right questions. Third, some teachers were able to create ways to collect data that they needed and knew the goals and standards that they were working toward.

However, some teachers struggled with certain aspects of data use. For instance, some teachers lacked the pedagogical knowledge and skills to act on the data. In other cases, some teachers did not think that they needed to engage in data-driven practices because they already had the answers and they didn't think data would provide any new information. The following section describes these findings in greater detail.

Teachers use data seamlessly.

Teachers like Julie from Hoover incorporated data seamlessly into many aspects of her work. Julie used data to understand each child in her class. Julie had many ways

of collecting data about each student, including anecdotal notes or guided reading logs. Julie also used data to write summaries about students for IEP meetings, Student Study Team meetings, parent conferences, and even notes to doctors. The data that she included in her correspondences were both academic and behavioral and taken from both periodic and real-time data.

Mindy from Hoover was also an expert at using data seamlessly throughout her daily activities. She used district assessment data such as the WRAP, created her own assessment that she called the "addition to the WRAP," used the DRA reading assessment throughout the school year, and kept logs of student work and progress. Mindy also used both periodic and real-time data to inform her instruction and planning. When asked about the frequency of data collection and use, Mindy responded that she constantly collects different types of data and communicates with parents regularly, using data as a basis for their conversation. Mindy said, "I don't wait for report cards...I'll show [the parents] like every few weeks, look what your child did now!"

Both of these teachers were mentioned several times in previous sections because of their frequent and seamless use of different types of data in their daily practice. Both teachers saw data use as a part of their daily work.

Teachers provide opportunities for student thinking.

Some teachers were able to provide opportunities for students to share their thinking and they asked questions in ways that allowed them to gather information about student understanding. One teacher that was particularly savvy at questioning was Kristy from Hoover. During classroom observations, Kristy was often talking with students either as a whole class or individually while they were working. As mentioned earlier,

Kristy thought that questioning and listening to students was one of the most important ways to gather data, and she used this data to guide students' thinking. When asked about how she knew if students were learning, Kristy answered:

> I know when students understand a particular concept when they can consistently perform or use the concept in their daily work. [That's when] they have truly made it their own. This could be strategies in solving word problems, grammar and spelling as well as paragraphing and sentence structure being used correctly in writing assignments or journals. [It also includes] reading strategies being used and discussed during reading conferences.

In this statement, Kristy named various opportunities for students to demonstrate their understanding and talked about the importance of students' ability to apply conceptual knowledge in tasks or assignments. Similarly, Julie from Hoover used whole class instruction to tease out students' thinking when solving math story problems and used questioning strategies to identify areas where students needed more practice. Both of these examples showed that these teachers provided the right opportunities for students to apply and demonstrate their understanding, thus providing data for teachers about what students needed to work on.

At Baker, Jennifer used questioning strategies to guide students' thinking during small group work. In the previous example of her guided reading group described in the discussion of real-time data, Jennifer provided opportunities for her struggling readers to practice their reading and to work on skills that they struggled with. She asked guiding questions and used data gathered from student responses in order to help them as they struggled to master reading skills.

Teachers create ways to collect data based on standards.

An important aspect of data-driven decision making for teachers was knowing what they wanted their students to understand and having concrete goals for them to

achieve. Data use was very much dependent on knowing what these goals were and being able to assess students on where they were in relation to these goals. Teachers like Mindy and Kristy at Hoover created assessments and assignments in order to collect data that would inform them of student progress toward goals. Mindy, mentioned that she created the "addition to the WRAP" because she needed more information about her students' math abilities. Kristy mentioned several times that she created assignments for the purposes of assessing student understanding of concepts and skills. Kristy said in one statement:

> What I teach day to day depends upon my students. I check in to see how well they are mastering a concept in math, reading, and/or writing. With math we have to keep moving forward but we are constantly going back to revisit areas of need. With reading and writing it is knowing what needs to be covered because of our standards, but finding ways to do it where I get the most bang for my buck. I don't always want lessons to only hit one area but many areas like the character paper did.

Kristy's ability to use data stemmed from knowing specifically what the standards required and what students needed to be doing in relation to those standards. She was then able to create various assignments and assessments that addressed these standards.

Although some teachers used data well, other teachers struggled with certain aspects of data use. The following sections describe some of these struggles.

Some teachers lacked pedagogical knowledge and skills.

In some cases, teachers gathered data about students, but then lacked the ability to act on the data in such a way that would help students. For instance, Jennifer from Baker described how students needed more practice around a literacy concept called "response to literature." However, her instructional strategy was to give students more exposure with this concept. Jennifer said, "So you know...you just need to work harder on

response to literature...that's a hard skill for [this] grade. It's new but you just kind of keep pushing, pushing, pushing." At face value, this statement was not an uncommon statement for teachers to make. However, if students struggled with a particular concept, doing more of the same thing may not help students understand the concept any better. The principal of Baker explained the same type of situation in her description of a teacher collaboration meeting around benchmark data results. After analyzing benchmark data as a group, teachers identified students in need of additional support. The principal said that she had to develop specific strategies for teachers to work on with these students so that they would "not just re-read the text to them or re-teach it [the same way]. That's not going to do it." The principal did not think that the teachers knew how to develop these strategies on their own. Both of these examples showed that teachers were able to use data to target students, but then didn't know how to adjust instructional practice to help these students.

Teachers also admitted that they needed more help linking data with their instructional practice. Ann from Baker made the following statement:

> I think strengths in that probably I'm comfortable with [data]. It has developed over the years, at least the kind of data we keep and it works well. Weaknesses though, there's always room for improvement. So, I think...continuing to make that link with driving my instruction to meet the needs of what the data is telling me. I mean that's just something that I think you can never be perfect. There's always room to get better at that...so that's always an area I want to grow in.

In this statement, Ann was talking about wanting to grow in her use of data and linking the data to her instruction. In Ann's classroom, Ann collected data on students by keeping notebooks about their abilities, but there was little evidence of her using that data in her instruction. There was also little evidence of her probing for student understanding. Her classroom environment was a warm and welcoming place for

students, but it was not really clear how she used data from her notebooks, assessments, or from student responses to drive her instruction. Ann knew that it was important to collect data on students, but there was little evidence to show that she used the data that could have better informed her instruction.

Teachers sometimes approximated a particular teaching strategy, but haven't quite developed the skills to make the strategy effective. For instance, Gloria from Baker was working with a small group of seven students. She asked the students to take out their social studies book and turn to the chapter on the California gold rush. The following interaction took place between the teacher and the students:

> T: What's happening in California at this time?
> S: The goldrush.
> T: What do you think, Simon? What do you think the Road to Statehood means? (Teacher referring to title of the chapter)
> S: (mumbling but no audible response from Simon)
> T: Look at the title and picture. What is going on? What does it mean to say the Road to Statehood?
> S: Like a road to another state that they want to go to? Or that they are building a road?
> T: So you think they are building a road?
> S: Maybe they are trying to find gold. There are pictures (student points to the page)
> T: Two words I want you to think about. The words "growth" and "change." What do you think about the title the Road to Statehood in terms of growth and change?
> S: Maybe there are Native Americans or pilgrims?
> T: The pilgrims? Point on the map where you think the pilgrims came from.
> S: (points to California)
> T: (Teacher goes up to the map and points to Massachusetts). That's Massachusetts. What's going on in California?
> S: Native Americans lived there...and the people who made missions.
> T: Where did the people who made missions come from? Let's look at the globe...

At this point, the students were off track and looking at the globe. The group began to discuss the location of different countries and the path immigrants took to come to

America. Eventually, Gloria pulled them back together and said, "Wow. We really need a lot of work on geography." In this example, it was not clear what strategy she wanted the students to work on. Gloria continued to ask questions, but the questions got more and more off-track. Gloria explained that she used data to determine her small groups, either from DRA assessments or benchmark data results. She knew that the data indicated that these students were struggling readers, but she did not demonstrate that she knew specifically how to address the students' learning needs or if she knew what their learning needs were. Data were used to target students, but her instruction lacked a clear understanding of what students should know and be able to do. Thus, her small group instruction was unfocused and unproductive.

In all of these cases, the teachers had good intentions and were trying to engage in data-driven practices. But, as Ann stated above, there is still room for improvement in terms of teacher pedagogy and capacity to use data in their work.

Some teachers had all of the answers.

In some cases, teachers indicated that they already knew what the data would tell them and therefore did not rely on data to inform their practice. One particular example was Jennifer from Baker. Jennifer stated:

> Sometimes, [it's] probably a weakness, I think I already know what the kids need and so sometimes I won't pay a lot of attention to the data or I won't spend a lot of time looking at okay, which questions did they miss and you know, try to figure out why....sometimes that takes a lot of time pouring over data from a unit I've already taught and now I have to plan for the next unit and I'm not going backwards.

Already knowing what the kids needed without relying on what the data would show was not an uncommon statement that was made by teachers, especially teachers with a lot of years of teaching experience. In another instance, Jennifer made the following statement,

"Having taught [this] grade for approximately 15 years, I know the parts of the curriculum that are troublesome for students and I plan extra instruction and practice from the beginning." This assessment made by Jennifer about what students struggled with may not be wrong, but Jennifer's past experience caused her to plan ahead based on trends from years past. However, the question becomes whether the teacher's experiences inhibit her from seeing new information. If she is not looking at student performance with true inquiry, is she missing important data that could actually help inform her practice? In a final statement, Jennifer said:

> So some of it I already know just because I know the kids and...do I always need to look at the data from every single [test item]? No...and I don't. I will look at the benchmarks but really by the time they get them scanned and get the data in there, we've done the benchmark and we're done.

In this particular statement, Jennifer did not feel that certain data were useful for her because she felt she already knew enough about her students. The last part of her statement is also worth noting. Jennifer stated that they have "done the benchmark." Jennifer was indicating that the curriculum material that the data from the benchmark assessments addressed had already been taught in the classroom and this statement indicated that she was not going to go back to instruct the same concepts. Thus, data were not useful for her in two ways: she already knew what her students needed and new data were not going to cause her to go back and address what data would reveal about student performance.

In sum, variation in capacity to engage in data-driven decision making practices existed among teachers. Some teachers were able to use data seamlessly in many aspects of their work. Some teachers were able to ask questions and provided opportunities for students to share their thinking. Some teachers were particularly skilled at creating

assessments or assignments aimed at assessing students' progress towards grade level standards. However, other teacher struggled with certain aspects of data use. Some teachers lacked pedagogical skills to act on the data. Others felt that they didn't need to spend the time to examine data because the data did not provide new information, especially for veteran teachers who relied on past experiences to plan instruction.

Research Question #4: What Accounts for the Variations in This Select Group of Elementary Teachers' Ability to Use and Make Decisions Around Data Within and Across Schools?

Both Baker and Hoover belonged to the same school district and had the same area superintendent. The support for their work at the district level was the same. The principals and teachers received the same professional development, had the same opportunities to learn, and heard the same messages about district priorities. However, the area superintendent made it clear that although he worked at the district level to build principal capacity, it was the responsibility of principals and lead teachers to bring this learning back to the school site and to figure out the best methods for doing this. Thus, the responsibility of building teacher capacity fell on the schools. Specifically concerning data use, the area superintendent said:

> I think using data is absolutely critical. I think it's played a role when the principal is data savvy. When the principal puts the data out in front of the teachers and convinces the teachers to do something because of the data. So used correctly and used often and continually coming back to the data changes the practices. I believe that.

The area superintendent pointed out the autonomy that the district gave to the school sites regarding if and how teachers decided to use data. Moving schools forward with data-

driven decision making practices fell on the shoulders of the principal and teachers at each site.

Comparing and contrasting the data collected from both schools, several factors emerged that explained how teachers' engagement in data-driven practices was influenced. These factors included contextual and cultural differences at each school site as well as differences in teachers' perspectives concerning autonomy and ownership in their work.

Context.

Both Baker and Hoover belonged to the same district and were both under the leadership of the same area superintendent. The professional development for both principals and lead teachers were the same. The schools were only a few miles from each other. However, the contexts of the schools were somewhat different. Hoover was a magnet school with a focus on communications. The neighborhood students were from upper middle class homes. The students that attended Hoover either *chose* to go to Hoover or were from affluent homes in the neighborhood. Parents were extremely involved at Hoover. In fact, Hoover received the California Distinguished School Award last year for both their magnet focus and their parent involvement. Mindy from Hoover described the student population in the following way, "This school is definitely like a middle to higher socioeconomic school. The community is very involved...I have one English Learner in my class." Kristy also described the parent and community involvement as well as the diversity of students in the following statement:

> [We have] huge community involvement...we have lots of folks who grew up in this neighborhood, so there's been a lot of just keeping generation houses in the family, so it's nice to see that...[the kids] come from all over. [It's] still a predominantly white community, but you have a lot of different mixes of kids

> here. So different nationalities, cultures are appreciated, they've shared it in the classroom, they're not afraid to talk about it. There's not a lot of bullying where that is concerned. It's nice to see those socioeconomic, cultural as well as ethnic backgrounds...[there is] a lot of diversity here.

In this statement, Kristy was actually describing both the neighborhood students as well as the students that come from different areas because of Hoover's magnet school status. It's also important to note that because Hoover is a magnet school, students that chose to attend Hoover were provided with a school bus. Thus, students coming from different areas across San Diego County accounted for the diversity that Kristy was referring to in her statement since the neighborhood surrounding Hoover was predominantly white.

Baker, on the other hand, had a student population that was quite different. Baker's student population consisted of neighborhood students, but the neighborhood had a mix of both middle class families as well as families that received support from the government and lived in subsidized apartments. Parents were not as involved at Baker and many of the parents were at work while their children were in school. Jennifer described the student population in the following way:

> This school is not like the other schools in the cluster because we have a lot of section 8 housing...more of those kind of demographic problems...low income, poverty issues, that kind of stuff. A lot of the neighborhood people they won't send their kids here because they don't want them to go to school with those kids.

Similarly, Gloria from Baker explained that the reason for the lack of parent involvement was because parents had to go to school or work. Gloria said:

> Over the years, the apartments...have gone to section 8 which is subsidized housing...[parents] either have to go to school or work to get their welfare so a lot of them just go to [community college] for a class or two.

Teachers mentioned that students attending Baker were from low-income homes. Other teachers emphasized a different perspective about the student population. For instance, Ann from Baker said:

> You really do have quite a variety of kids coming from a lot of different kinds of backgrounds, ethnic as well as socio-economic. And we have a really good mix of kids with a lot of different kinds of backgrounds which makes it the real world. So you know, that's kind of fortunate.

Ann emphasized the benefits of the diversity of students rather than describing the demographics as a challenge.

The differences in school contexts may have had an influence on how teachers perceived their work with data. At Baker, there was a general sentiment that the population of students coming from lower-income homes was making the work at Baker more challenging. Gloria said, "Our test scores are not high enough. The other schools in the community, because they don't have the welfare kids, they have higher test scores than us." Gloria's statement reflected pressures that she felt from the surrounding community about test scores. Similarly, Jennifer from Baker said:

> I started here with over 800 students and now we barely have 400. It's just the neighborhood has grown...a lot of the neighborhood people don't want to send their kids here because they don't want them to go to school with kids of color. Let's be honest about it. It's sad to see that in this day and age, very sad to see one school so ostracized because of the demographic issue...now we're at [an API of] 837 and we need to be at [an API of] 900 ...how much can I pull out of these kids?

Jennifer expressed several challenges. First, she was saddened by the negative view the surrounding community had of the school. Second, she felt pressure to improve student test performance because the school was performing lower than other schools in the area.

In contrast, at Hoover, the student population consisted of students from upper middle class homes in the neighborhood or students who chose to attend the school

because of its magnet status. Teachers at Hoover did not express that they felt pressure to improve student performance. The principal at Hoover even stated, "We are fortunate here because we only have, I mean you will be shocked when you look at Data Director and you see the Far Below Basic [category]...there's only fifteen kids school-wide."

Thus, it is possible that data use at Hoover was seen by teachers as opportunities for students to further improve, especially since most of the students were already doing well. At Baker, the data seemed to add to pressures they felt about their performance in relation to the performance of schools in the surrounding area.

Culture.

The two participating schools also had very different school cultures. This was evident by the way the teachers and principals talked about their school focus, data use and the work involved with it, pressures from the district or school, and the way teachers interacted with each other. In the following section, the cultures of both schools will be described as well as their implications for teachers' data-driven decision making practices.

At Hoover Elementary, the environment was very friendly. Office staff greeted people as they entered the school and parents were found all over the school grounds and in the classrooms. Teachers were often walking and talking with each other and with the students. The windows were brightly decorated with student work and banners with the school mascot, a panda bear, were hung around the school with a logo that said, "Panda Pride." The principal was usually out on the playground talking with parents, interacting with students, or helping teachers in their classrooms.

Hoover Elementary was focused on building a strong school community as well as the development of the whole child. Mindy from Hoover stated, "They say communications is the focus, which is what I have observed, but also...it's the student as a whole...I think building a community is a big thing at this school." This was also evident by the principal's involvement with the students. During one school visit, the principal was addressing the students in a particular classroom. She was introducing a document called the Resolution of Respect that she wanted teachers and students to sign. The resolution outlined how students and teachers were expected to treat each other. The teacher in this classroom had already signed the resolution and posted the document in the front of the class. The principal was having a discussion with students and asking students to give examples of what it meant to respect others. One student said that bullying other kids was not the "panda way," illustrating that there was a common language used by the staff and students that was indicative of the expectations for behavior. Overall, the school environment was friendly, open, and positive.

The principal described how teachers at Hoover were willing to learn and improve their practice. For instance, she gave an example of a teacher who was willing to be videotaped so that the principal could share some of this teacher's questioning strategies with the rest of the staff during a staff professional development session. The principal indicated that she wanted data use to be implemented in a way that helped the teachers authentically do their work. She said that she wanted teachers to figure out how to use data in a way that would help them. The principal said "[I want teachers to] hone in on what's working for them. You know it's got to be for the user. It's got to work for the

user." She explained that teachers were still developing their skills around data use, especially with the use of technology and data tools:

> They're still getting used to getting on [Data Director] and really looking at it... these are veteran teachers who have their systems in place and they have systems that work, but they need to understand that they can see a bigger picture or a smaller picture so much easier.

However, she also indicated that teachers were willing to try new data tools like Data Director. For instance, the principal gave the following example:

> I was so proud...I went to a teacher's room the other day, last Wednesday. It was a minimum day and she called me over and said, "Can you help me with this Data Director?" And I said, "I'm so proud you're on here messing around." So I said, "How is Data Director working?" She goes, "I don't know. This is like my second day on it." So I mean I'm moving these guys like this little by little.

This example showed that data-driven decision making was still a work in progress for teachers when it came to technology. However, the principal explained that teachers used a variety of data, not necessarily collected with the aid of technology, and that they really knew their students:

> You know their strengths are that they just have so much [data]. You can walk into a classroom and these teachers can tell you, they have portfolios on [students]...They'll have artifacts of the student work that is current...and it builds. Their strengths are they got a lot to show you and they can tell you about a kid. They can tell you, well he's still doing his letters backwards and they can practically tell you the day that the letters go forward. I mean their strengths are that they really pay attention and they use their data. I think they use it...they bring me data. They show me where everyone is [and] what they are doing.

Thus, when it came to teacher capacity to collect and use data, the principal believed that teachers were doing it and willing to learn how to do it better.

Teachers also had positive feelings about the principal in terms of her leadership as well as her stance on testing and accountability. For instance, Kristy said:

> We have an administrator that knows kids, knows who they are, isn't afraid to kind of challenge that system, that thinking of test scores, we've got to have great

> test scores. Yeah, that's there, but it's also who are these kids and what are we doing for them, and how are we moving them along?

In this statement, Kristy explained that the principal thought about the needs of the students and what teachers were doing to help them, acknowledging that testing and accountability was still important, but was not driving the work of the school. Although the principal was not necessarily driven by test scores, some of the teachers at Hoover seemed to still be focused on it. For instance, Kristy said, "I know that paper and pencil test prep is this huge thing here in our school [with] teachers, I won't say the administrator." This statement indicated that other teachers at the site were concerned about test results, but it also implied that she did not feel this kind of pressure from the principal. Thus, there was still a culture at Hoover that indicated there was pressure about testing and getting results, but the pressure seemed to come from other teachers and not top-down. Kristy said, "I think [the principal] is much more open...much more thinking about kids as individuals. Yes, she has the monkey on her back, she has the district [pressure]...but I think she sees the picture more realistically."

The teachers at Hoover worked closely together, mostly by grade levels. The school was structured so that there was a minimum day each week for staff meetings, professional development, and time for teachers to meet together in teams. Teachers also met on their own time to collaborate, plan instruction, and look at data. Julie from Hoover said:

> We get together and share ideas...we do a lot of recess conferences, what we call hall conferences. You'll see a lot of that if you walk around here. You'll see folks standing around together and a lot of the time they're the same grade level and they're doing some quick conversations...a lot of what we do is drop off the kids at lunch, stand out there and do a quick grade level meeting.

Not only did teachers meet formally and informally, but they were also willing to help each other in the classroom. For instance, Julie referred to a time when she was teaching a new grade level for the first time. She explained how the staff at Hoover helped her with her new experience, "We have such a great staff, I was constantly talking to other teachers...they were saying, come in and I will show you...they gave me so much time." Although the sentiments were mostly positive about staff collaboration and interaction, Kristy said that the teachers' relationships and ability to work together was dependent on whether they shared the same belief systems about teaching and learning. Kristy explained:

> [Julie] and I are constantly talking...if you team it's a good thing if you have that counterpart that can talk with you on that same level and has the same thinking and you're collaborating on that level. But when you run into those people that just want cookie cutter [lessons] and everybody is on the same page, it becomes much more difficult.

Kristy implied that some teachers at the Hoover liked to align their lessons in such a way that everyone would be doing the same thing at the same time, creating tension for teachers that wanted to do things a little differently and respond to what real-time data told them about the needs of their students. Although teacher collaboration was evident at Hoover, there were still some tensions around how teachers decided what to do in their classrooms with their students and thus tensions for why there was variation in data use among Hoover teachers.

The school culture at Baker Elementary was quite different than the culture at Hoover. When asked to describe her school, the principal explained that most of the teachers had been at Baker for a very long time and were somewhat resistant to change. She felt that the school culture was still a "culture of blame" for underachievement. For

instance, she said that many teachers blamed the kids, blamed the school, or blamed the district for poor work conditions or for poor student performance. The principal also said that many teachers relied on their teaching experiences rather than on data to guide their practice. She explained this in the following statement:

> I think that there are a number of staff members that are definitely learners that want to know more, but I think that there's a majority of teachers that feel their experience is enough and that it should be enough to teach their kids...if the kids aren't learning then it's the kids' [fault]. So there's a number that definitely are not learners. They've learned all they need to and they feel they're done and now it's the children's job to learn.

The principal said that her efforts to change this thinking included professional development, providing time for teachers to meet in grade levels, and providing data for teachers to work with. However, she said that she was limited by the teachers' union contract and that she could only have a certain number of mandatory meetings. The principal expressed that it had been very difficult to move the teachers and that she had received push back from them on many issues. However, the principal also said that there were some teachers at Baker who were willing to learn and were good with data use. She said:

> [These teachers will] name specific kids and they say, I know these three were able to do this on the test they gave them...they'll have an exit slip or some sort of activity. They are aware because they are wandering around the room and they talk to [students]...and they have a way of keeping track.

The principal continued her description of the different types of teachers at Baker in the following statement:

> It's hard to talk as a whole because there are some of them that are very good at using data and they know their kids and they know how they are achieving. Then, there are others that you go over and over the Data Director reports. It's almost like they're on auto-pilot...It's more of well, I'll see how they do and I'll know if they are learning or not learning...or they just have a "feeling" because they've been teaching so long.

Although there were teachers who were willing to learn and use data, a majority of teachers were resistant, relied on their past experiences, and were less willing to try new ways of doing things, including use of new sources of data.

Teachers at Baker expressed that they felt a great deal of pressure from the school and the district. They felt that the emphasis was on test scores and that they were being asked to do too many things. Gloria said:

> The district and the school...are requiring more and more from us and people are stressed. I'm working...my weekends are all school work. Every night I go home and I do school work. I have no life...it's really affecting my health....They've added so much. They put so many roadblocks in our way, like blocking the stockroom...we have duty two times a week instead of once a week...they put more and more roadblocks in front of us all the time.

Gloria felt that she was overworked and that the school and district were demanding too much from teachers. Teachers also felt that there was an over-emphasis on testing. Jennifer said:

> [The district] is very driven by tests scores...a lot of pressure to perform. Sometimes I don't know whether [these students] need that much pressure...our API was 837 this year and that's as high as it's ever been, but we need to be at 900. That was the message, so it's demoralizing. We've done better than we've ever done and it's not good enough when ten years ago the goal was to get to 800...I am working 10, 12, 14 hours a day and...it's like it doesn't matter...you know, sometimes I feel like okay, all we do is take tests and get ready for the tests.

Jennifer felt that even though the school showed improvement, this was not good enough and teachers were continually being pushed to get better and do more. She continued to explain that she didn't think that test scores gave her enough information about student performance. She said:

> As far as testing and everything being so driven by testing, I don't think it's good...I don't think tests scores always tell you what kids know. That's just from personal experience...test scores tell me what kind of mood he was in on the day

> he took the test. It didn't tell me what he didn't know. I don't think those things are ever taken into consideration when children at a school or a school district or a teacher are being told whether or not they're doing a good job by this data because it's one test on one day. I think we have to be careful with it.

Jennifer made several claims in her statement. First, she did not think that tests always gave a complete picture of student understanding. Second, she implied that schools and teachers were being judged and evaluated based on test scores and she didn't think that this was an accurate or fair way to assess their performance. Ann expressed the same concerns about test scores. Ann said:

> I think in the global sense it's all about test scores and things are driven by that. Now at our school as well as our area, I know we're focusing on higher level thinking and higher level questioning to get kids to delve more into the quality and depth of discussions in the work they do, helping them to just be better thinkers can only help their academic work and their test scores and everything else...I can also see as a 3rd, 4th, or 5th grade teacher being bombarded with statistics and data and having it come at you from every single angle and needing to know, okay, how is this going to help me?

Ann's statement showed that she empathized with other teachers and the pressures they felt about testing. Ann also expressed how she saw the value of data-driven decision making in the following statement:

> I think we're expected to not only be aware of [data], but to use it as best we can...there are some teachers that are probably a lot more comfortable with that than others in terms of that driving your instruction...I can see it as something good if you know how it will help you, but at the same time it's just a lot...you're in the trenches every day.

Ann valued data, but her comments indicated that it took a lot of work and that being "in the trenches every day" made working at Baker difficult.

Each week, teachers at Baker were given a minimum day to engage in professional development and collaborate with other teachers. Although there was some evidence of teacher collaboration, much of the work around data seemed to be done by

teachers individually. Teachers analyzed benchmark data during special time carved out by the principal, but these meetings were supervised and led by the principal. Jennifer said, "The other second grade teacher and I do a lot of planning together, so we do things about the same time." However, when asked if they looked at data together, she said that they did not and that she used her own time to look at data. When I asked the principal if teachers valued the extra time given to them for collaboration, she said:

> Not at all. In fact, they were asking me to take it out of the budget for next year. When we look at the data on the benchmarks, we analyze the questions to see which ones students really struggled with and try and figure out why they struggled. Where were they confused on that question? And that brings us to our plan for what we're going to do with the kids during small group time...it's really key to figuring out what our kids are struggling with and what we need to do differently both in the classroom and in small group. [The teachers] have asked for that to be removed. They would rather do it in an hour during the grade level time, which it just is amazing to me... [it's] so valuable. That tells me that they just plug along.

There are several interesting points to note about the principal's statement. First, the special benchmark meetings were led by the principal and teachers were not left to do this work on their own. Is this because the principal didn't trust that they had the capacity to do the data analysis work or was it for some other reason? Second, if teachers were asking the principal to take it out of the budget, it implied that teachers were not finding these meetings useful for their work or found more benefit in working with their own data.

Based on the descriptions of the two schools and the statements made by principals and teachers, it is evident that the cultures of these two schools are very different. Hoover not only seemed to have a positive school community, but teachers seemed to view data as helpful to their work. The teachers at Baker seemed to feel a lot more pressure and felt that testing, accountability, and data-driven decision making was

more of a burden than a benefit. Thus, in accounting for the differences in teacher capacity, the cultures of the schools may have influenced teachers' perspectives about their students, their workload, and their attitudes toward data use.

Teacher Autonomy and Ownership.

The teachers across both school sites had different perceptions of how much autonomy and decision making authority they thought they had over their curriculum, their instruction, and their use of data. Teachers at Hoover felt that they had a great deal of autonomy while teachers at Baker felt limited autonomy.

Teachers at Hoover felt that they had the power to make instructional decisions and to use any type of data that would inform their work. Julie from Hoover expressed how much authority she had with her curriculum and instruction. She said she had the freedom to use different teaching methods and assessments. Julie in particular loved to integrate art with academics and felt that the principal really supported her decisions. Similarly, Kristy said:

> Within my classroom I feel like I have the decision-making authority over what I teach and how I teach it. I know that our principal supports what we do as long as we have data and evidence to support the decisions I am making. For example, at the beginning of the year we were told that we could choose whether we did the MAPs testing or not. I chose not to do it. It is given three times a year and takes a lot of class time. Since we already give the districts benchmarks three times a year, I felt that the kids would be "test crazed" and I knew that I could get data to inform my teaching in other ways.

Both Julie and Kristy both felt that they had the power to make the kinds of decisions that would best serve the students in their classroom. Although both of these teachers felt that they had the authority to make these types of decisions, this was a change from past years. Both Julie and Kristy explained that previous administrators would not have allowed this type of curricular freedom and that their current principal had really changed

things at Hoover. Kristy commented, "From prior administrators, this kind of thinking would be considered not being a team player." Mindy, who was only starting her first year at Hoover, also felt that she had curricular freedom. Mindy said that she planned instruction and shared with the other grade level teachers, but ultimately they all chose what worked for them in their classrooms, including what assessments to give and how to collect and use data. The principal of Hoover said that her rationale for teachers was to decide what worked for them, as long as it produced positive results. She tells teachers, "Find something that works for you. Find that it's measuring the kids. What are we doing...if it's not giving you what you want to know, then you need to try something else."

Teachers at Baker were more mixed about their feelings concerning their autonomy and decision making authority. Some teachers felt constrained by the district curriculum. For instance, Jennifer from Baker said:

> I do have the ability to teach what I want, however the district writes its own literacy curriculum and gives benchmark tests based on that curriculum. So I will use the district curriculum as a guide to make sure I've covered what is on the benchmarks and I will often choose my own materials.

Jennifer stated that she did have autonomy in her classroom, but that her choices were influenced and guided by the district curriculum and benchmark tests. In another instance, however, Jennifer described how she held one child back to repeat the same grade because of this child's poor performance and numerous absences during the school year. In this sense, Jennifer felt that she had the authority to make decisions, and ultimately her decision was supported by the principal.

Still, other teachers at Baker felt that district and school decisions were being made for them. For instance, during one classroom visit with Gloria, she took her

students to a room that she called the Book Room. During this time, students were looking at crates of books and choosing one or two books to take home with them. Gloria explained that this was a type of lending library. She said that the area superintendent and principal asked all of the teachers to de-clutter their rooms and that these books were the "leftover" books that nobody wanted. Students were then allowed to take these books home and bring them back using the honor system. Gloria said that teachers could only use books and materials that supported the district curriculum. Gloria gave another example of how she wanted to teach social studies, but felt she couldn't because the district's focus was on literacy, math, and science and that the benchmark exams only addressed those three content areas. The statements made by Gloria indicated that she felt that she had limited decision making authority over what she was supposed to teach and that much of her instruction revolved around what was going to be addressed in district benchmark exams.

The principal at Baker explained that there was a fine line when it came to teacher autonomy. She expressed that she would like to give teachers autonomy, but she felt that many of them did not use their time well or productively in ways that would improve student performance. She explained that the alternative was to make specific requests for teachers to do certain things, but they would respond negatively and say, "You are telling me what to do." The principal said that she felt like no matter what she did, she could not win and that this was a catch 22 situation. She said that teacher capacity building had been difficult because of the school culture that had existed for a long time.

Not only was there a difference in teacher's perspectives about autonomy, there was also a difference in how they took up responsibility for their work. Teachers had

different perspectives about their personal responsibilities for their instruction and for student learning. For instance, Kristy from Hoover said:

> What do I need to get better? I'm evaluating myself as well as them and it's how do I push those that have those really high test scores? But I can drive myself totally insane at times...because I am constantly going how can I reach that child? I know this and this...how do I reach them? What do I do? So, it's not necessarily a formal assessment. It might be pulling up and talking to them. Looking at what they're doing that day. How they're talking, how they're interacting, how do they get into the discussion in the classroom?

In this statement, Kristy talked about evaluating herself and thinking not only about how students performed, but also how her instruction may have contributed to the test results. Her thinking revolved around how to get better and how to reach all of her students. Kristy took ownership of her work with students. The principal at Hoover described teacher ownership in the following statement:

> Is this a job for somebody or is it a way of life? For me, this is a way of life. Education's a way of life...out of my twenty-two teachers, for eighteen of them it's a way of life...The others, you know, it's a job for one reason or the other. That doesn't mean they don't take ownership. They still do in a way, but those eighteen solid teachers out of twenty-two really take ownership...these are their kids. They know them inside and out...They use that knowledge and that data to help [kids] get through the next week, next month, and rest of the school year.

According to the Hoover principal, the majority of her teachers considered education a way of life and thus, they took the actions they thought would matter for their students.

At Baker, there was a mixed response about how teachers felt about their responsibility and ownership. The principal at Baker described how some of her teachers were really conscientious about their work:

> There are those that I know are looking at the content and looking at the end results and they're planning their questions based on where they want students to be at the end of the lesson...I think the teachers who [use data] well are the ones who will try new things, who are open to new things and they don't stick with, "I've done this for years so I know what I'm doing." The ones that do it well

> have the mindset, "It's my job as a professional to continue to improve myself...to do my craft."

Jennifer from Baker said, "I obviously love teaching. I'm here for the kids and not here for all of the [other stuff]...I think kids are much more than a test score." Clearly, Jennifer was in the teaching profession because she enjoyed her work with her students. However, there were other teachers that did not have the same perspective about teaching and learning. The principal explained:

> I think the majority [think], "I've been doing this for so many years it's always worked, there's always going to be those kids that don't get it. So if they're not getting it then it's the kids." They don't have that teacher efficacy where they can look at themselves and say what can I do differently? For some reason, I don't know if it's the years and years of experience, it's almost like...they're going to point the finger at the child. It's not me, it's the child. And when kids do learn it's usually well their parents are just wonderful so that even when they're successful they don't always see it as something they've done.

The principal's statement not only indicates that some teachers were not taking responsibility when the tests results were poor, but they also did not take credit when the results were good. Moreover, they were blaming the child for success and failure. These teachers did not have a sense of efficacy and a sense of ownership about their work. They did not link their actions to student performance, thus making data-driven practices unlikely to take hold.

In terms of accounting for the differences between the teachers within and across both schools, the issue of teacher autonomy and ownership played a role in how teachers took up data-driven practices. Teachers that felt they had curricular and decision making authority as well as ownership in their work seemed to use data in ways that worked well for them. Teachers that felt that decisions were being made for them or felt that their

actions did not impact student performance had a harder time taking up data-driven decision making practices.

CHAPTER FIVE

CONCLUSIONS

The purpose of this research study was to gain a deeper understanding of how classroom teachers engaged in data-driven decision making practices. I examined the kinds of data that teachers used, why they used these data, and how they used these data to inform their practice. The participants in this study included six classroom teachers from two different schools within the same school district as well as the principals from both schools and the area superintendent. Efforts to hide the identities of the district, schools, and participants have been taken in order to protect the participants as much as possible. Pseudonyms have been used for the names of the schools as well as for the names of the principals and teachers.

As a result of this qualitative case study, there were several key findings. This chapter will begin with a summary of the key findings and discuss how these findings contribute to the literature on data-driven decision making. This chapter will also discuss implications for school leadership as well as recommend areas for future research.

Summary of Key Findings

The first research question addressed why and how classroom teachers chose specific data to inform their practice. This question was answered in four ways. First, teachers from both schools used a variety of data to inform their work. Teachers had access to many different types of data and were able to receive data in a timely manner. Second, teachers at both schools used data in different ways and for different purposes. For instance, data were used to determine trends about the whole class, identify struggling students, or help with determining small group instruction. Third, teachers

created their own assessments to get additional data if the data that were already provided did not meet their needs. Fourth, teachers also chose not to use certain types of data if they did not find them useful for their practice.

The second research question focused on how data were being used by teachers to make instructional decisions. The findings for this question were dependent on the types of data that were collected. Teachers used two types of data to inform their instruction. The first type of data, which I call periodic data, can be described as data that provide information about students at a given point in time. This type of data can be formative, summative, formal, or informal. Periodic data were used by teachers to determine overall trends in performance for whole class, small groups, or individual students. Periodic data were used as a starting point for teachers as they planned instruction or as a checkpoint for student progress. The second type of data, which I call real-time data, can be described as data collected in-the-moment. These data were collected while teachers and students interacted with each other. Real-time data were based on student responses, both written and oral, and provided teachers with information about student understanding of a particular concept or skill as it was happening in the classroom. Teachers' decision making with real-time data depended on their ability to ask the right questions to guide student thinking. Real-time data also required teachers to listen to student responses and make decisions about next steps. Teachers used real-time data to inform their work with individual and small groups of students, as well as with whole class instruction.

The third research question focused on what teachers did well and what they struggled with in terms of their engagement in data-driven practices. The answer to this

question revolved around the notion of teacher capacity. Teachers' capacities to engage in data-driven decision making practices differed both within and across schools. As mentioned earlier, all of the teacher participants in this research study engaged in data-driven decision making in some way. However, the actions that they took depended on their capacity to collect, interpret, and respond to both periodic and real-time data. As a whole, teacher capacities at Hoover were stronger than teacher capacities at Baker. In terms of what teachers did well, some teachers used data seamlessly and incorporated data into many aspects of their work. Some teachers guided student thinking by asking the right questions and providing opportunities for students to share their thinking. Some teachers also knew the standards and goals for their students and created ways to collect data to determine students' progress towards those goals. However, some teachers struggled with data-driven decision making practices because they lacked the pedagogical knowledge and skills to act on data. In addition, some teachers did not think they needed to engage with new sources of data, such as data from district benchmark exams. These teachers thought they already had the information they needed from information that they gathered on their own about student performance or they thought that they knew what was best for their students based on their years of teaching experience.

In addition to the individual reasons accounting for teacher data use, several factors may have accounted for the differences between the teachers' capacities to engage in data-driven decision making practices between the two schools. These factors included both contextual and cultural differences as well as differences in teachers' perspectives concerning autonomy and ownership of their work.

Hoover and Baker had different school contexts. The student populations were different and the way the teachers perceived their school status in relation to the other schools in the neighboring community was different. Hoover had a student population of students that came from affluent homes, had may supports, and performed well. Baker had a student population that came to school with more challenges. At Hoover, teachers had a positive view about data. They saw data as confirmation about how well students were performing and perceived data use as a way of enhancing student performance. In contrast, teachers at Baker had a more negative view about data and thought that data called out problems with student performance, which added to pressures that they felt about their work as well as pressures about how they compared to other schools in the community.

Hoover and Baker also had very different school cultures. At Hoover, the culture emphasized the importance of the whole child, which included both academic and behavioral expectations. Hoover's culture emphasized respect, collaboration, and trust. Teachers trusted the principal's leadership and the principal trusted the teachers' decisions. The culture at Baker was very different. Baker's culture seemed to reflect past hurts from previous school and district reform efforts. Baker teachers admitted to being hurt by people in positions of authority in the past, influencing their level of trust with their current principal. Likewise, the principal did not seem to fully trust teacher judgment, evidenced by her leading teacher meetings focused on benchmark assessments. Teachers seemed less willing to engage with new ideas, such as examining and planning around data, because they felt it was an unnecessary demand, took time away from them, and added to their workload. Thus, cultural differences accounted for the way teachers

viewed data-driven decision making practices. At Hoover, data use added to teachers' learning and teachers saw the benefits for themselves, for their students, and for their school community. At Baker, data-driven decision making was seen as more work and would require more time from the teachers.

Teachers also had different levels of autonomy at each of the school sites. At Hoover, teachers had autonomy. The principal trusted teachers' decisions, but also held them accountable for the decisions that they made. Teachers decided how they were going to plan, teach, and assess student performance. They decided what data to use and how to use it. Teachers at Hoover felt responsible for what happened with students in their classrooms and took ownership of their work. There was a sense of teacher efficacy and teachers saw the link between their instructional practices and student performance.

At Baker, teachers did not feel that they had full autonomy. Teachers felt that they were able to make classroom decisions, but these decisions were constrained by their perception of district demands. The principal at Baker felt a tension around the notion of teacher autonomy as well. The principal wanted to give teachers more autonomy, but ultimately did not fully trust their capacity to make decisions. Teachers also did not see the link between their instructional practice and how students performed. Teachers "covered the curriculum" and felt that they did their job. Statements made by the principal indicated that teachers felt that student performance, good or bad, was not a result of their work, but rather a result of outside factors. There seemed to be a lack of teacher efficacy and a lack of ownership in their work. Thus, teachers at Hoover felt they had autonomy, felt ownership in their work, and had a sense of efficacy and therefore, teachers saw data use as beneficial to their work. Teachers at Baker had less autonomy,

felt a lack of ownership and connection to student performance, and were less likely to see the benefits of using data to improve their practice.

Contributions to the Literature

This research study contributes to the knowledge-base around classroom teachers' use of data in several ways. A discussion of these contributions will be focused on the following areas:

1. Data-driven decision making, teacher practice, and micro process studies
2. Issues of access, time, and usefulness of data
3. Teacher autonomy and ownership
4. Teacher capacity and efficacy

The findings from this research study add to our understanding of these specific areas. The following sections will describe the findings in relation to the existing literature.

Data-Driven Decision Making and Micro Process Studies

In this research study, teachers' use of data was examined at the micro level, paying particular attention to *why* and *how* teachers used data to inform their work. The existing literature on data-driven decision making calls out the need to focus on the *practice* of data-driven decision making. Coburn & Turner (2012) emphasized the need to investigate the practice of data use at the ground level, while Cuozzo (2010) pointed out the need to focus on instructional practices and pedagogy. This research study contributes to the literature on data-driven decision making by responding to both of these demands. Specifically, the findings around the uses of different types of data, periodic and real-time data, showed that different types of data required different skills. In the case of periodic data, teachers had to know how to examine, analyze, and interpret

data for planning purposes such as planning whole group or small group instruction or for targeting students. In the case of real-time data, teachers had to know how to use questioning strategies to guide students' thinking. Real-time data use required the ability to listen, decide, and act on data in-the- moment. Little (2012) claimed that micro process studies help build our understanding of the details, nuances, and patterns of social interaction. In this case, a close examination of teachers' use of real-time data revealed the types of interactions teachers constructed around data and illustrated how they made meaning from the data collected through student responses.

While this study provided a detailed look at how teachers used data in-the-moment to guide student thinking, it also indicated that more research needs to be conducted around the linkages between data-driven decision making and pedagogical practices. Teacher capacity mattered. In this study, teachers' capacities differed in terms of how they were able to use data and implement appropriate instructional strategies in the classroom. Savvy teachers were able to use data seamlessly, provide opportunities for students to share their thinking, and were able create ways to collect data that informed them of students' progress towards standards. Those less skilled lacked the pedagogical knowledge and skills to act on data or did not think they needed to use new sources of data because they relied on their own teaching experiences to guide their practice.

Data-driven decision making entailed different knowledge and skills that depended on the type of data collected. Teachers needed to be able to use periodic data to make decisions about trends or target specific areas of instruction. Teachers needed to be able to use real-time data to make decisions in-the-moment to guide students

understanding of a particular concept or skill. This research study contributes to the literature on data-driven decision making and micro process studies in that it reveals these various aspects of teachers' engagement in data-driven decision making practices.

Issues of Access, Time, and Usefulness of Data

The existing literature on data-driven decision making suggests that access to accurate and timely data has been a challenge for educators often impeding data use (Lachat & Smith, 2005; Ingram, Louis, & Schroeder, 2004; Dembosky, Pane, Barney & Christina, 2005; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). The findings from this research study, however, showed that even with readily accessible data, teachers still had challenges with data use. Teachers at both schools had a plethora of data and the data were timely. The school district had invested in the Data Director tool making many types of data available. Teachers had plenty of data to inform their work, but they also were not inundated by the data (Popham, 2008; Roderick, 2012). Data may have been available, but ultimately data use was dependent on teacher capacity to do the work around data. Teachers who were savvy with data spent time thinking about and evaluating different sources of data in relation to their work. In some cases, they chose not to use certain data because they did not find the information from these data useful. They also used different data for different purposes. For example, teachers who were skillful with data use thought that benchmark data were useful for identifying class trends but were also able to use real-time data from student responses to inform them of student understanding. These teachers were thoughtful consumers of data that understood the merits of different types of data and the different purposes for them. In contrast, teachers who lacked the capacity to think through data and determine the usefulness of different

types of data were also less engaged in data-driven practices or were less able to act on the data that they had.

In some cases, teachers thought that despite the wealth of data that was available to them, they still could not get the information that they needed in a certain area to inform their work and felt they had to create additional assessments that would provide additional information. Still, others thought that much of the data was repetitive and did not find all data useful for their decision making. In all of these cases, teachers were engaging in data-driven practices because they were considering what data meant for their work. This did not mean, however, that the decisions that they made were the "right" decisions or that their actions were the "right" actions. It just meant that they had access to data, examined them, and thought about what these data might mean for their own situations in their own school and classroom contexts. Thus, teachers who lacked the capacity to know what to do with data ultimately limited the opportunities to fully support students.

The existing literature also highlights that one of the biggest challenges for teachers was finding enough time to study the data that was available to them and collaborate and interact with others around data (Dembosky et al., 2005). The issue of time was not a major theme in the way teachers talked about data in their interview responses or from classroom observations. Teachers at both school sites had a built-in school structure, a weekly minimum day, which gave teachers time to collaborate either as a whole group or with grade level teams. Certainly, the teachers talked about how time was a challenge for completing the curriculum or for grading student work. However, teachers did not necessarily indicate that they needed more time to analyze and

interpret data. Instead teachers challenged the usefulness of this time for their work. The principal at Baker gave additional time for teachers to examine data from the district benchmark exams, but the teachers told her that they did not want this additional time and to take it out of the budget for the following year. In interview responses, teachers from Baker expressed mixed opinions about the usefulness of analyzing benchmark data together as a group as well as the usefulness of examining the contents of each benchmark question. This study challenges those that argue that data use is reliant on time. Needing *more time* for data analysis was not an issue at either of the two schools in this study. Rather, teachers seemed to have more of an issue with *what happened* during these times.

Teachers had different opinions about what structures were useful for them in terms of how to use their time around data use. Young (2006) discussed the use of agenda-setting as a strategic leadership action that helps to encourage and support teacher data use. The issue of agenda setting for meetings designed to build teacher capacity around data use may have been part of the challenge that the principal and teachers at Baker struggled with. Although the principal's agenda was focused on data-driven decision making and was meant to guide teachers toward data use, ultimately the teachers did not find their meeting time meaningful. Thus, in thinking about agenda setting for teachers and data-driven decision making, there is a need to construct this time grounded in the needs of the teachers involved and supportive of the practices that they define as useful for their practice.

Issues of Autonomy, Power, and Ownership

The issue of teacher autonomy and ownership seemed to have played a role in how teachers took up data-driven practices in this study. Teachers at Hoover felt that they had decision making authority and took ownership in their work, using data in ways that they felt worked well for them and for their students. Teachers at Baker had mixed responses about their autonomy and decision making authority and felt constrained by district or school policy, curriculum, or leadership. Stephens et al. (1995) examined the power structure between assessment, instruction, and decision making and found that autonomy and power played a key role in how teachers' took up data-driven decision making practices. Stephens et al. (1995) stated, "Decision making is a process in which the distribution of power and authority is central, perhaps the central issue" (p. 492). Interestingly, both of the schools belonged to the same district and were under the leadership of the same area superintendent. The district curriculum, assessments, and accountability were the same. Yet, the school contexts were vastly different and their perspectives about what was expected from them were very different. The findings from this case study showed that teachers who had more autonomy and felt more ownership in their work had more capacity to engage in data-driven practices. In contrast, teachers who had less autonomy also had less ownership in their work and were less likely to view data as valuable in informing their practice.

For teachers at Baker, there was a tension that existed around teacher autonomy. They felt they had a limited amount of autonomy and were constrained by the district and school leadership. The principal admitted feeling conflicted about teacher autonomy and while wanting to give teachers more freedom, she questioned teachers' ability to make

appropriate decisions. Teachers at Hoover felt that they had a great deal of autonomy and felt that they could determine how they wanted to teach as well as what types of assessments and data to use. The principal at Hoover gave more autonomy to the teachers and trusted teacher judgment, and at the same time, teachers showed a greater capacity to analyze, interpret, and act on data.

Stephens et al. (1995) in their research study of four different school districts found that districts where teachers had less autonomy also had school leaders who did not trust teacher judgment. In the case of this research study, the principal at Baker struggled with trusting teacher judgment as well. Was the lack of trust because teachers lacked the capacity to do the work? If teachers do not feel trusted to make their own judgments, will they ever feel enough ownership in their work to want to improve their capacity? Is this a cyclical problem where teachers do not get better at using data because they feel controlled and powerless, and because teachers are not getting better, principals are less willing to give up control?

We learn from the Hoover case that when teachers are given more autonomy, they show more ownership in their work and feel more responsible for student outcomes and therefore data-driven decision making practices are supported. The differences between the two schools indicate that the relationship between autonomy and data-driven decision making is worth looking into in greater depth. These findings have implications for a broader discussion on how to design professional development that improves teacher capacity around data-driven decision making practices.

Teacher Capacity and Efficacy

Another challenge called out in the literature on data-driven decision making is around teacher capacity and efficacy. Teachers may lack the capacity to engage in data-driven practices or the district may lack the resources to support and build teacher capacity (Kerr et al., 2006). Teachers may also vary in their capacity to use data (Swan & Mazure, 2011). The findings from this study are consistent with the literature on data-driven decision making and teacher capacity. Teachers at both Hoover and Baker varied in their capacity to collect, analyze, and act on data both within and across schools. Some teachers were able to seamlessly use data in many aspects of their work while other teachers lacked the pedagogical skills to act on data. Dunn et al. (2013) found that the ability to analyze and interpret data was different than teachers' ability to connect their interpretations to instructional decision making. Teachers may know how to analyze and interpret data, but not know what to do with it. The opposite may also be true. Teachers may have strong pedagogical knowledge and skills, but lack the ability to analyze and interpret the data. Thus, when considering teacher capacity around data-driven practices, it's more than a matter of whether they are using data or not using data.

The findings from this study, as well as the body of literature around teacher capacity and data-driven decision making, imply that there are subsets of skills that need to be considered. These skills may include how to choose data, how to analyze data, how to plan instruction around data, and how to implement instruction based on data.

The findings from this study also suggest that there are skills required in collecting and acting on real-time data. Real-time data collection involves the ability to carefully listen to student responses, determine student understanding based on these

responses, and act on data collected during these interactions. All of these skills influence teachers' capacities to engage in data-driven practices and each may require a focused plan for professional development.

Ingram et al. (2004) found that teacher efficacy was a challenge to successful teacher engagement in data-driven decision making. They found that some teachers believed that it was their job to deliver the curriculum but that learning was the responsibility of the students. This type of "blame the student" disposition that frees them from taking responsibility was also evident among some of the teachers in this case study. Some teachers believed that they were responsible for student learning and would use data to question themselves about what they did to contribute to these results or what they could do to change future results. Other teachers blamed the system, the students, or the quality of the test questions for poor results and distanced themselves from achievement results. The principal at Baker made an interesting statement about teacher efficacy stating that even when students performed well on assessments, teachers still did not take credit for it. The lack of ownership in their work was a challenge at Baker and points to the challenges to teacher efficacy as a whole. If teachers do not see a relationship between their instructional practice and student performance, it would be very difficult to make a case for using student data to inform instruction.

Implications for School Leadership

The findings from this research study have a number of implications for district and school leadership when understanding data use among teachers. As districts and schools move forward with efforts to improve how teachers engage in data-driven practices, considerations of the following may be helpful:

1. Leaders need to recognize that different types of data reveal different information and they need to align their expectations about data use with the type of data provided.
2. Leaders need to consider the appropriate balance between teacher autonomy and accountability because these factors influence teachers' feelings of empowerment, ownership, and efficacy.
3. Leaders need to foster a culture based on continuous learning and data use.
4. Leaders need to construct professional development based on the varying skill-sets required to effectively engage in data-driven practices.

Recognizing Different Data and Aligning Expectations

District and school leaders need to recognize that different types of data reveal different information. Data are used in different ways for different purposes. Thus, the expectations for data use should be reflective of the types of data in question. For instance, periodic data and real-time data are both useful, but for different reasons. Periodic data can reveal information about whole class trends, targeting students for small group instruction. Periodic data can provide information about student understanding, but only to a certain extent. Periodic data can inform a teacher about *what* their answer was to a particular question, but would not necessarily be able to provide information about *why* a student chose that particular answer. However, real-time data can help teachers hone in on student understanding and help answer the *why* question. Real-time data collection involves teacher and student interactions that allow teachers to dig deeper into student thinking. Taken together, both types of data may complement each other and provide a more in-depth picture of what students know and are able to do.

For instance, it may not be realistic to expect teachers to use state standardized tests to determine reasons for student misconceptions about a particular concept when the state tests were not designed to provide that type of information. Thus, leaders must consider what kind of data are provided to teachers, have a clear understanding of what information that data may reveal, and how teachers might best use these data to inform their work.

Finding the Balance between Teacher Autonomy and Accountability

The findings from this study also have implications for district and school leaders in terms of teacher autonomy and ownership. How do school leaders find the balance between giving teachers autonomy and decision making authority as well as hold teachers accountable for their work? In this case study, the principal at Hoover encouraged the teachers to "use what worked for them" and to provide the evidence for their decisions. Teachers, in turn, chose data that they felt had value to them and acted on these data in their classrooms. The result was that Hoover teachers were able to answer *why* these data informed their practice and *how* they were using these data to inform their instruction. They were not saying that they "just knew what students needed" based on experience or intuition. In contrast, teachers at Baker felt their principal had limited their decision making authority in all aspects of their work. The principal guided some of their work with examining certain types of data, which not all teachers found useful and created somewhat of a tension between teachers and the principal. This tension between autonomy and control points to a leadership challenge for school and district leaders; too much control may lead to teacher resistance, while the opposite may not provide desired results in teacher practice or in student performance. The implication for leadership then

is to consider how power relations in a particular context affect teachers' perspectives about their autonomy as well as how this affects their feelings about ownership in their work.

Fostering a Culture Based on Continuous Improvement and Data Use

The findings in this research study also show that school culture may have had a role in how teachers took up data-driven practices at their school sites. These findings are consistent with the existing literature on data-driven decision making that indicate that building a culture around learning is a key aspect in promoting data-driven practices (Sutherland, 2004; Datnow et al., 2007; Earl & Katz, 2006; Datnow et al., 2008; Noyce, Perda, & Traver, 2000). Earl & Katz (2006) explained the importance of school culture in the following way:

> School leaders have little chance of using data unless the school as a whole is also committed to being a community, routinely challenging existing beliefs and practices, and using data to make sense of their environment and to think about their future. This means a dramatic shift in mind set for the whole school so that data become a core part of school culture. (p. 20)

At Hoover, data were used not as an *addition* to the work that the teachers were doing, but as a *part* of the work that teachers were doing. Data use was a part of how the school functioned, with teachers thoughtfully choosing and using data that they felt impacted their students. At Baker, however, data use seemed to be an additional piece of work that some of the teachers did not feel they had time for. The difference can be partly explained by the difference in school culture, beliefs and attitudes toward data.

Influencing data use then calls for creating a school culture that embraces data-driven decision making practices. As Sutherland (2004) has pointed out, school culture is also related to fostering teacher buy-in for data driven work. Teachers at Baker and

Hoover had varying perspectives about the benefits of using data to inform their practice. Teachers at Hoover chose and used data that they believed made a difference in their work with students. Teachers at Baker relied more on their instructional experiences they have had over time. Buy-in was related to their perceptions of teacher efficacy. If teachers believed that what they did affected student performance, than the benefits from data use would likely create more buy-in from teachers.

Thus, fostering a school culture around continuous improvement and data use remains a leadership challenge for educators, but as this study shows, it is an important factor in promoting teachers' data use.

Constructing Professional Development Based on Skill-Sets That Support Data Use

Finally, the findings from this research study have several implications for district and school leaders as they plan professional development around data-driven decision making. School leaders need to consider the varying types of data, what these data may reveal, and how these data have various uses. For example, data from benchmark assessments or state standardized tests may be used for particular purposes like determining trends, but may not be useful for evaluating individual student understanding of a particular concept. Whereas, real-time data based on student responses and student work may provide more in-depth information about student understanding.

In terms of building teacher capacity, school leaders need to also recognize that data use demands different skill-sets. These skills include how to analyze data, how to plan instruction around data, and how to implement instructional strategies. School leaders also need to consider real-time data and that the skills needed to collect and act on real-time data include developing teachers' capacities to listen for students' responses

and ask the right questions. In terms of professional development, Supovitz (2009) explained:

> Well constructed assessments can do a good job of identifying students' strengths and weaknesses, but are silent on the crucial question of what instructional response can best improve student understanding and how to best deliver that instructional action. This suggests that we need more regularized and readily available repertoires of responses to patterns found in assessment data. This would also require a deeper understanding of why students don't understand particular concepts... teachers need complementary and less formal measures and other techniques that they can use to hone in on learning problems in addition to a range of responses to increase student understanding. (p. 223)

In this statement, Supovitz (2009) is highlighting the importance of helping teachers with determining and acting on appropriate instructional responses to data. The implication for school leaders, then, is to provide professional development that addresses these needs. The findings from this research study reveal that data-driven decision making involves varying skill-sets including how to analyze, interpret, and plan instruction around data, and also how to collect and respond to real-time data. Building teacher capacity to use data requires that school leaders recognize and plan professional development around these varying skill-sets.

Limitations

There were several limitations to this study. First, this was a case study involving two schools in one particular district with its own unique district and school contexts. Although much can be learned from the insights and perspectives gained from this study, the findings cannot be generalized to other contexts or situations. Particularly, this research study was conducted with teachers from two public elementary schools from a large school district. Thus, the findings from this study are limited to the elementary level as well as to public schools.

In addition, this case study involved a close examination of only six teachers. More teacher participants would have been welcomed and might have provided more insight to the research study, furthering our understanding of data-driven decision making with teachers. In addition, these teachers were all volunteers. The fact that these teachers were in some way more willing to participate in the study and open their classrooms to research, compared to teachers who did not volunteer, may have influenced the findings in this study.

Time and scheduling constraints also limited the amount of time that was spent at each school site and was somewhat inflexible. The amount of time that was spent at each school was limited to the pre-planned dates between the teachers and the researcher. Because of the researcher's geographic location, additional site visits were not possible. Thus, teacher planning meetings and professional development sessions that occurred outside of the pre-planned dates were not observed or captured during the course of this research study. This is a limitation because these additional meetings may have provided more insight to the ultimate research findings.

In addition to scheduling limitations, teacher absences and illnesses also influenced the amount of time spent in each teacher's classroom. These unplanned absences affected my ability to observe teacher engagement with data during each site visit. Although ample time was spent with each teacher over the months of data collection, the unintended absences were not ideal. Particularly, teacher absences affected access to all teachers for the final interview process.

Finally, my positionality can be seen as both a benefit as well as a limitation. As a former teacher and vice principal in the participating district, my prior conceptions of

teaching and learning may have affected my ability to collect and analyze data from this study in both positive and negative ways. For instance, my experience as an educator may have allowed me to capture particular teacher actions and student responses that I might not otherwise have noticed without teaching experience. However, this perspective may also have limited my ability to see beyond what I already knew as an educator. Thus, my perspectives as a former teacher and administrator affected how I interpreted classroom instructional practices and teacher-student interactions.

In addition, my prior experiences with this particular school district may have influenced my perspectives and interpretations of the overall district context. Because I was a former teacher and administrator in the participating school district, my understanding of the district history and context was skewed by my personal experiences.

My positionality may also have influenced what teachers were willing or not willing to share with me during the data collection process. Teachers knew that I had been a former teacher and administrator in the school district. This knowledge may have influenced how the participants responded to research questions as well as influenced the actions that they took in their classrooms during site visits. For instance, teachers may have been more comfortable with the fact that I had taught in the classroom and may have been more willing to share authentic experiences with me. On the other hand, they may also have felt more concerned that I was a former administrator and may have limited what they shared with me during interviews or other interactions. In any case, my positionality may have influenced the data that I was able to collect from teachers and ultimately had an influence on the ultimate findings for this study.

Areas for Future Research

The findings from this research study suggest several important areas for future research. First, there is a need for more micro process studies on data-driven decision making specifically in the area of teacher practice (Moss, 2012). Although this study contributes to the literature on micro process studies, further research is needed with teacher participants from different districts and from different contexts to better understand how teachers engage in data-driven practices. Specifically, this research study focused on only six teachers from two different public elementary schools within the same school district. More research will need to be conducted, for example, in middle school and high school settings as well as in different types of school organizations such as charter schools and private schools.

This research study also suggests that future research is needed to investigate factors or conditions that help build teachers' capacities around data-driven decision making, specifically around their classroom practices and interactions with students. Finally, the findings from this study also suggest that more research needs to be conducted on how autonomy, authority, power, and ownership influence data-driven practices. This study only begins to examine how these factors may influence data-driven practices. Broader and more focused studies around these issues could help educators better understand these relationships.

Conclusion

Data-driven decision making has become an important educational issue in the United States primarily because of federal and state emphasis on school accountability. Federal and state policies require educators to use data to inform decision making and the

assumption is that educators know how to analyze, interpret, and use data to make informed decisions. However, there is limited research around teachers' engagement in data-driven practices. This research study has contributed to our understanding of teacher data-driven decision making at the micro level.

A case study/cross case analysis design was used to examine why and how teachers from two elementary schools in San Diego County chose certain data to inform their instructional practice as well as how they used data to inform their work. Findings from this study show that teachers from these schools used many sources of data to inform their work and used these data differently depending on the type of data. Teacher's capacities to use data were different and several factors may have accounted for these differences, including contextual and cultural factors as well as differences in teacher autonomy and ownership. This study offers insight into the challenges that educators face as they attempt to respond to federal, state, and district mandates to use data and offers important implications for future research.

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Appendix A

Teacher Interview Protocol Guide- Fall

Teacher Interview Protocol Guide- Fall

1. What is your background, including experience in education and years of teaching?
2. How long have you been teaching at this school? What grade do you teach?
3. How would you describe your school in terms of demographics of the students and the overall school community?
4. How would you describe the school district? What is the district's overall focus?
5. What is your school's focus? Does your school have particular school goals (performance goals, discipline goals, etc.)?
6. What kinds of standards and assessments do you follow? Do all teachers at your school site use the same kinds of assessments?
7. How do you know when students are meeting the standards? What kinds of assessments do you use to determine student performance? How often do you use these assessments? (Examples: end of unit exams, benchmark assessments, formative data such as homework assignments, etc.)
8. Does your school encourage the use of data? If so, how?
9. Do your school and/or district collect data? If so, what kinds of data and how often?
10. What kinds of data do you find most useful? Why?
11. Do you use data to make decisions in your classroom? If so, what kinds of decisions do you make? How do you make these decisions? Can you give me one or two examples of how you have used data to make decisions?
12. Do you have access to data? If so, what kinds of data and how often to you receive this data?
13. Do you receive support in using data? If so, what kinds of support and how does it facilitate data use?
14. Have you attended any kinds of professional development (school or district) focused around data use? If so, describe what you have learned during these sessions

15. Were these professional development sessions (from question #14) helpful to your practice? Explain.
16. Were these professional development sessions optional or mandatory?
17. Do you discuss and use data when meeting with other teachers? If so, describe how data is typically used and how often you typically meet with other teachers.
18. Do teachers at your school site have authority to make curricular decisions? If so, what types of decisions do you make and how do you make them?
19. Do you share data with other teachers? If so, what kinds of data and for what purpose? Can you provide an example?
20. Do you share data with your students? If so, what kinds of data? Can you provide an example?
21. Do you or other teachers find that using data is difficult? If so, what do you think is difficult? Why?
22. Do you think that using data for decision making is important? Why or why not?
23. Do you think that using data for decision making is feasible? Why or why not?
24. What are your school's expectations around data use?
25. What are your district's expectations around data use?
26. What do you consider to be your strengths around data use to make decisions in your classroom? Why?
27. What do you consider to be your weaknesses around data use to make decisions in your classroom? Why?
28. Do you think that using data has helped improve student achievement? If so, how? Can you provide examples?
29. If you could receive additional support in using data, what support would you like?
30. Is there anything else that you would like to share about data driven decision making in your classroom, at your school site, and within your district?

Appendix B

Principal Interview Protocol Guide- Fall

Principal Interview Protocol Guide

1. What is your background, including experience in education, years of teaching, years of principalship, etc?
2. How long have you been a principal (or current position) at this school? [If not the principal: Describe your position at the school site.]
3. How would you describe your school in terms of demographics of the students and the overall school community?
4. How would you describe the school district? What is the district's overall focus?
5. What is your school's focus? Does your school have particular school goals (performance goals, discipline goals, etc.)?
6. What kinds of standards and assessments do you follow? Do all require teachers at your school site to use the same kinds of assessments?
7. How do you know when students are meeting the standards? What kinds of assessments do you use to determine student performance? How often do you use these assessments? (Examples: end of unit exams, benchmark assessments, formative data such as homework assignments, etc.)
8. Do you encourage the use of data? If so, how?
9. Do your school and/or district collect data? If so, what kinds of data and how often?
10. What kinds of data do you find most useful? Why?
11. Do you use data to make decisions for the school? If so, what kinds of decisions do you make? How do you make these decisions? Can you give me one or two examples of how you have used data to make decisions?
12. Do you have access to data? If so, what kinds of data and how often to you receive this data?
13. Do you receive support in using data? If so, what kinds of support and how does it facilitate data use?
14. Have you attended any kinds of professional development (district or other) focused around data use? If so, describe what you have learned during these sessions

15. Were these professional development sessions (from question #14) helpful to your practice? Explain.
16. Were these professional development sessions optional or mandatory?
17. Do you discuss and use data when meeting with teachers? If so, what kinds of data and for what purpose? Can you provide an example?
18. Do teachers at your school site have authority to make curricular decisions? If so, what types of decisions do they make and how do they make them?
19. Do you find that using data is difficult? If so, what do you think is difficult? Why?
20. Do you think that using data for decision making is important? Why or why not?
21. Do you think that using data for decision making is feasible? Why or why not?
22. What are your expectations around data use at your school site?
23. What are your district's expectations around data use?
24. What do you consider to be your teachers' strengths around data use to make decisions in the classroom? Why?
25. What do you consider to be your teachers' weaknesses around data use to make decisions in the classroom? Why?
26. Do you think that using data has helped improve student achievement? If so, how? Can you provide examples?
27. If you could receive additional support in using data, what support would you like? Why?
28. If you could give additional support to your teachers in using data, what kinds of support would you give them? Why?
29. Is there anything else that you would like to share about data driven decision making at your school site, with your teachers, and within your district?

Appendix C

Teacher Interview Protocol Guide-Spring

Teacher Interview Protocol- Spring

1. Could you tell me a little bit more about the culture of your school? Maybe your thoughts and feelings about what's it's like to work here?
2. When it comes to access of data, do you feel like you have it? Do you feel like you have access to different kinds of data? Do the data that you get help you to do your work? How?
3. What about in terms of timeliness? Do you get information in time to use it?
4. Can you give me an example of data that you have access to and how you have been able to use it specifically?
5. Do you feel like you have time to collect, analyze, and/or interpret data?
6. Do you do this alone or with other teachers?
7. Can you give me a specific example of a time that you have been able to do this?
8. Do you feel like you have decision-making authority over what you teach and how you teach it?
9. Do you feel like you have decision-making authority when it comes to what data to collect and how you use it?
10. Are you accountable to the principal in any way when it comes to data use?
11. Are you accountable to other teachers in any way when it comes to data use?
12. Do you feel like you have to use data in your work or is this something that you feel like you do on your own?
13. In general, do you feel like what you do with your students makes a difference?
14. In teaching, what matters most to you? Can you give me a specific example?
15. Could you tell me a little more about what you think the district or your Area focus is?
16. How do you use CST and Benchmark data? Can you give me an example?
17. What about ARI and/or DRA? Can you give me an example?
18. Do the data from these assessments help you with decision-making?

19. Can you give a specific example of how these assessments have helped you make a decision?

20. What about other types of data that you gather? EX: from your classroom, notes, homework? Can you give me an example of a specific instance where you have used other types of data?

21. How do you know when a student understands a particular concept that you are teaching?

22. How do you decide what to teach or focus on in your instruction from day to day?

23. What kinds of data inform your instruction the most? Can you give me an example?

24. Could you tell me more about your area's focus on questioning...do you feel like you have been implementing more in depth questioning? Has is helped with your instruction?

25. What kinds of training and/or support do you receive when it comes to instruction?

26. Are there opportunities for you to learn? Can you give me an example?

Appendix D

Principal Interview Protocol Guide- Spring

Principal Interview Protocol- Spring

1. Could you tell me a little bit more about the culture of your school? Maybe your thoughts and feelings about what's it's like to work here?

2. When it comes to access of data, do you feel like you and your teachers have it? Do you feel like you and your teachers have access to different kinds of data? Do the data that you get help you to do your work? How?

3. What about in terms of timeliness? Do you get information in time to use it?

4. Can you give me an example of data that your teachers have access to and how they have been able to use it?

5. Do you feel like your teachers have time to collect, analyze, and/or interpret data?

6. Do they do this alone or with other teachers?

7. Can you give me a specific example of times they have been able to do this?

8. Do you think the teachers have decision-making authority over what to teach and how to teach it?

9. Do you feel like the teachers have decision-making authority when it comes to what data to collect and how to use it?

10. Are the teachers accountable to you in any way when it comes to data use?

11. Are the teachers accountable to other teachers in any way when it comes to data use?

12. In general, do you think that the teachers take ownership in their work? Do they think that what they do matters? Can you give me an example?

13. In general, what kinds of data do you think your teachers use the most? Can you give me an example?

14. Do you think your area's focus on questioning has helped your teachers with instruction?

15. What kinds of training and/or support do they receive when it comes to instruction and specifically around your area's questioning focus?

16. Are there opportunities for the teachers to learn? Can you give me an example?

Appendix E

Open-Ended Questions

Data Use: Teacher Open-Ended Questions

What kinds of data inform your instruction the most? Can you give me a specific example of how you have used data and what you did in your classroom as a result?

Do you feel like you have time to collect, analyze, and interpret data? Do you do this alone or with other teachers? Can you give me a specific example?

Do you feel like you have decision-making authority over what you teach and how you teach it? Do you feel like you have decision-making authority when it comes to what data to collect and how you use it? Explain.

How do you know when students understand a particular concept that you are teaching? How do you decide what to teach from day to day?

Do you think that data informs the instructional decisions that you make in the classroom? Do you feel like these decisions make a difference with your students? Can you give a specific example?

Appendix F

Classroom Observation Guide

Data Driven Decision Making in the Classroom
Observation Protocol Guide

Date: **Time:**	**Teacher:**
Location:	**Grade level/Subject:**

What is the teacher's lesson objective?
Describe what the teacher is doing.
Describe what the students are doing?
What is the general pattern in which the teacher interacts with students?
Is there evidence of teacher data use in the classroom? If so, describe the type of data used and how teacher is using it. (Example: formative assessments, exit slips, evidence of student groupings, etc.)
What types of formal data (e.g., test scores) does the teacher refer to or use? Describe.
What types of informal data (e.g., observational, anecdotal, check-ins) does the teacher refer to or use? Describe.

How does the teacher check in with students to check for understanding? What is the frequency of these types of check-ins?
Do you see evidence of data influencing/directing the classroom lesson? If so, how is data influencing the classroom lesson?
Does the teacher discuss any type of data with students? If so, how does the teacher present it? What does the teacher and students do with the data?
Comments: